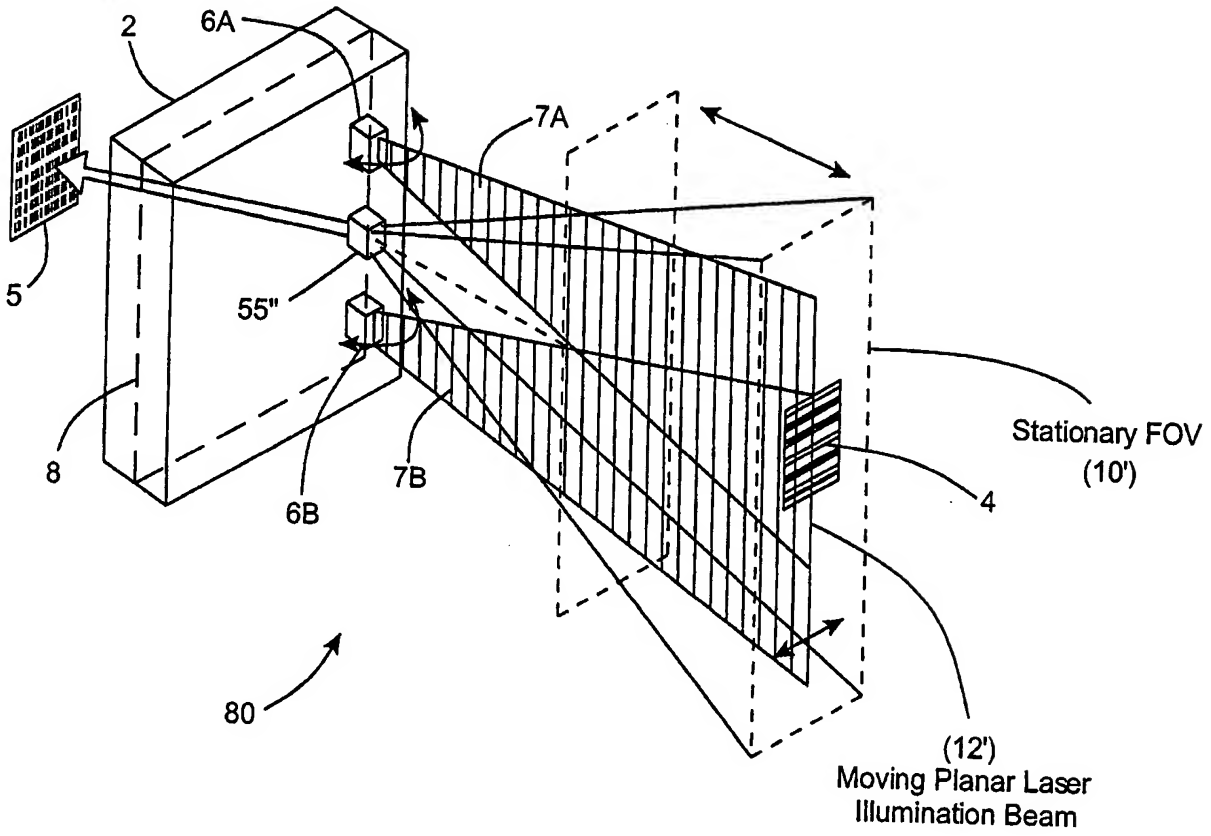


FIG. 6A

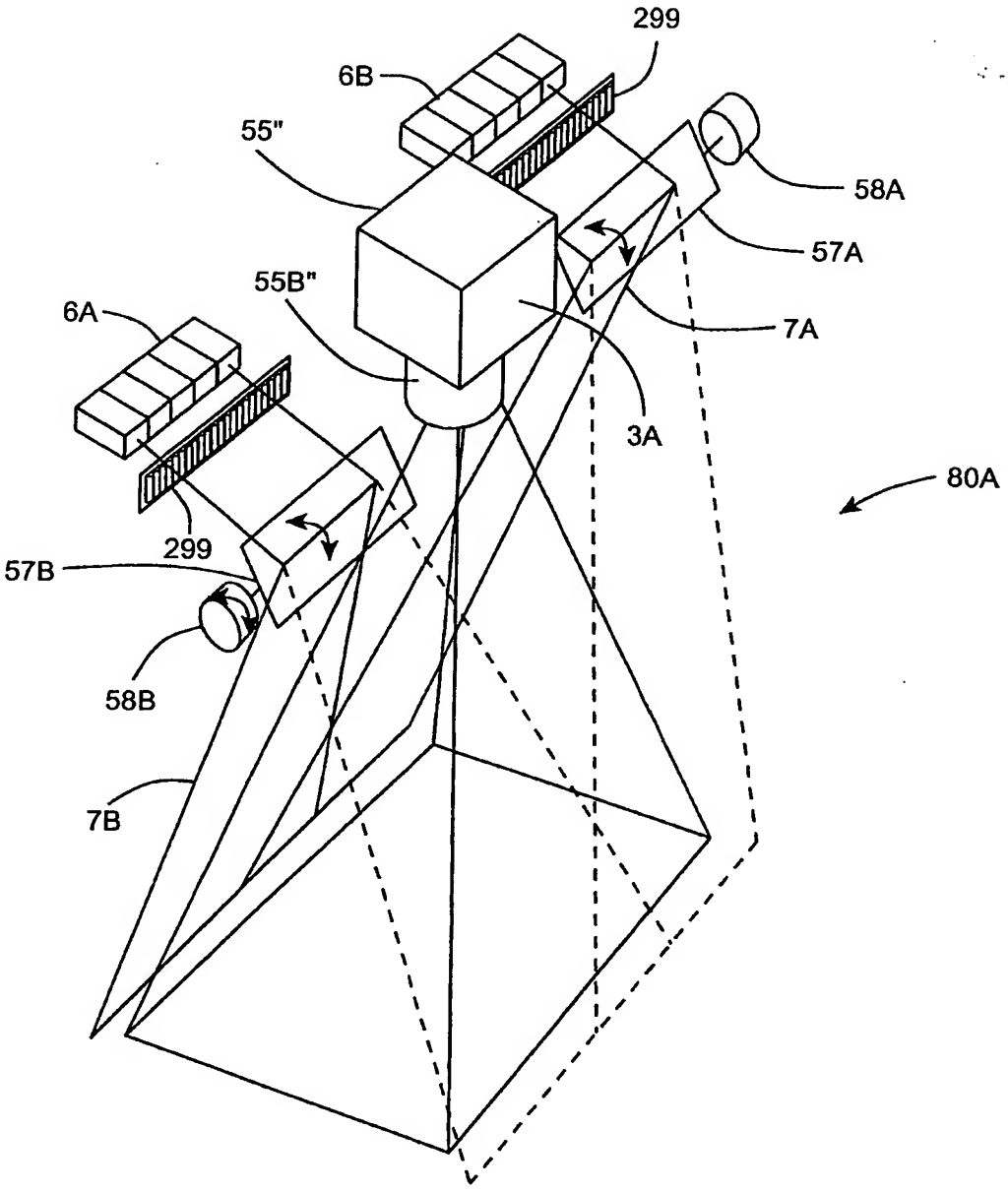


FIG. 6B1

(1) Variable Focal Length Camera Lens
(2) Variable Focal Distance

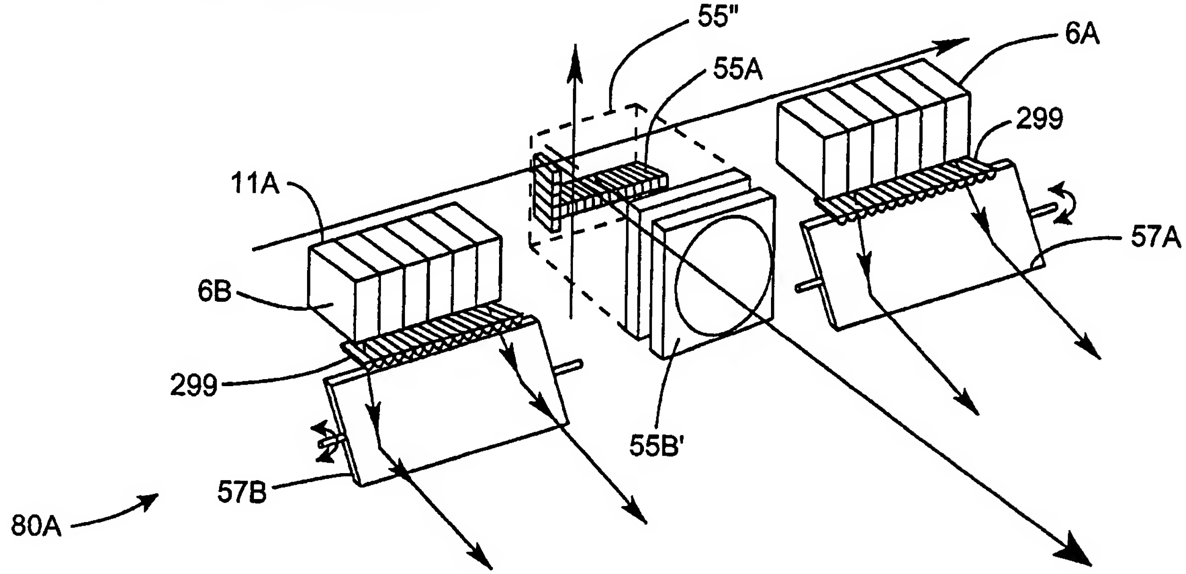


FIG. 6B2

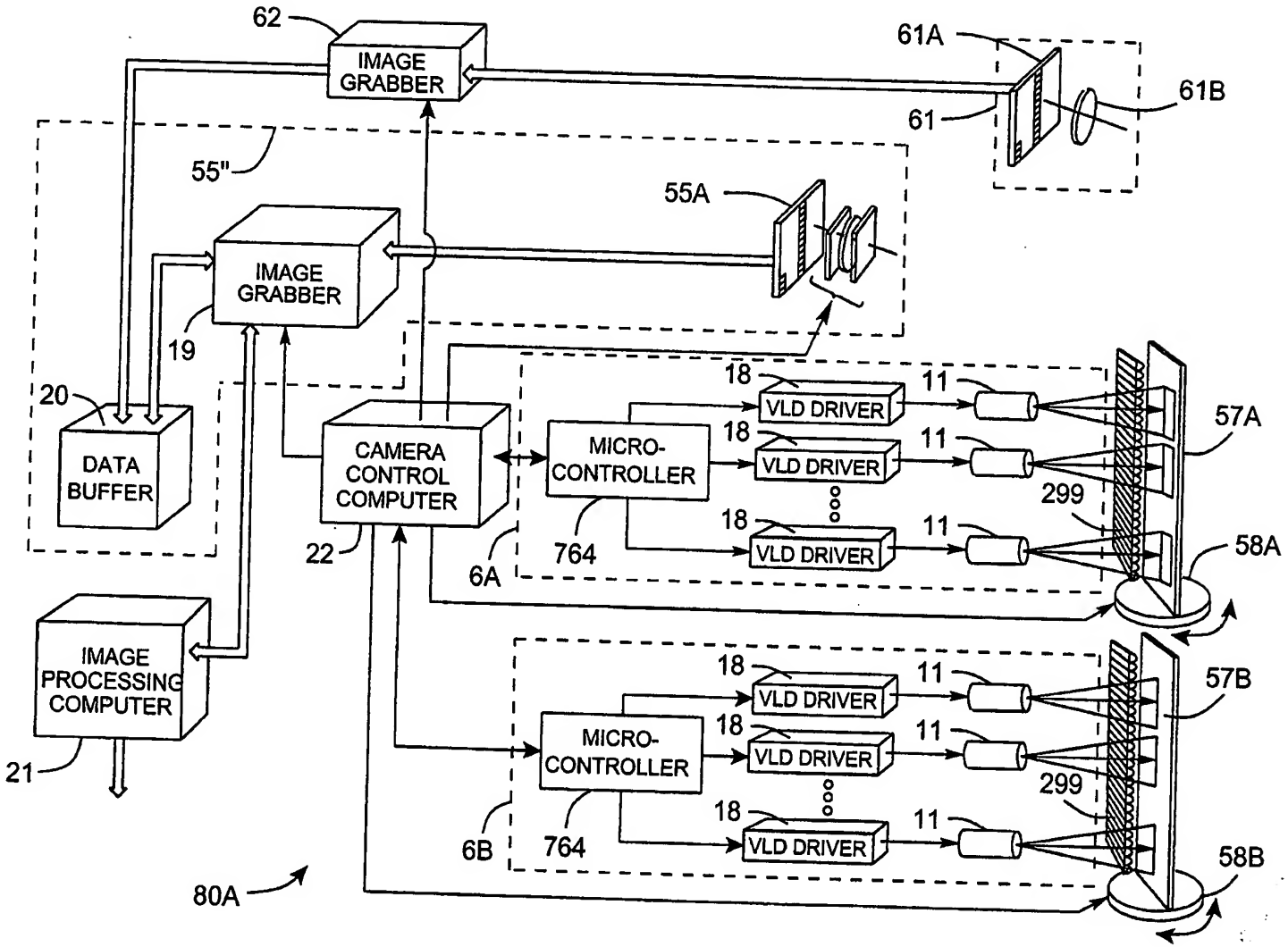

62
IMAGE GRABBER
61A
61B
61
55"
55A
IMAGE GRABBER
19
20
DATA BUFFER
CAMERA CONTROL COMPUTER
22
6A
MICRO-CONTROLLER
764
18
VLD DRIVER
11
57A
299
58A
IMAGE PROCESSING COMPUTER
21
MICRO-CONTROLLER
6B
764
57B
58B
80A

FIG. 6B3

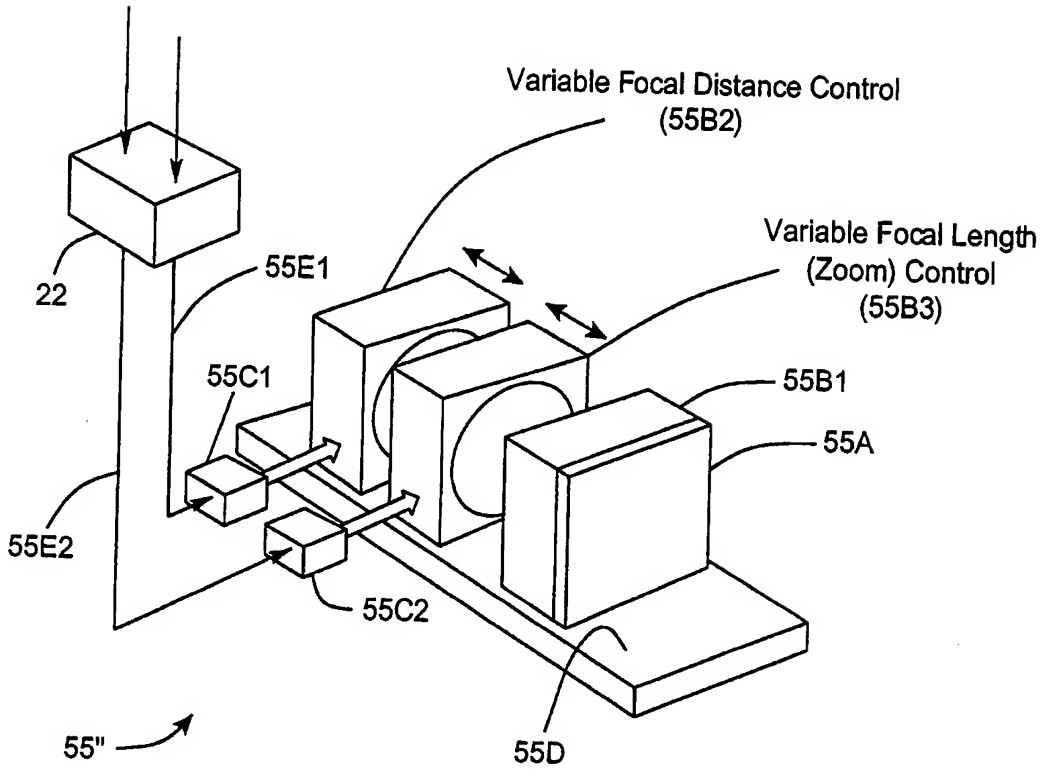


FIG. 6B4

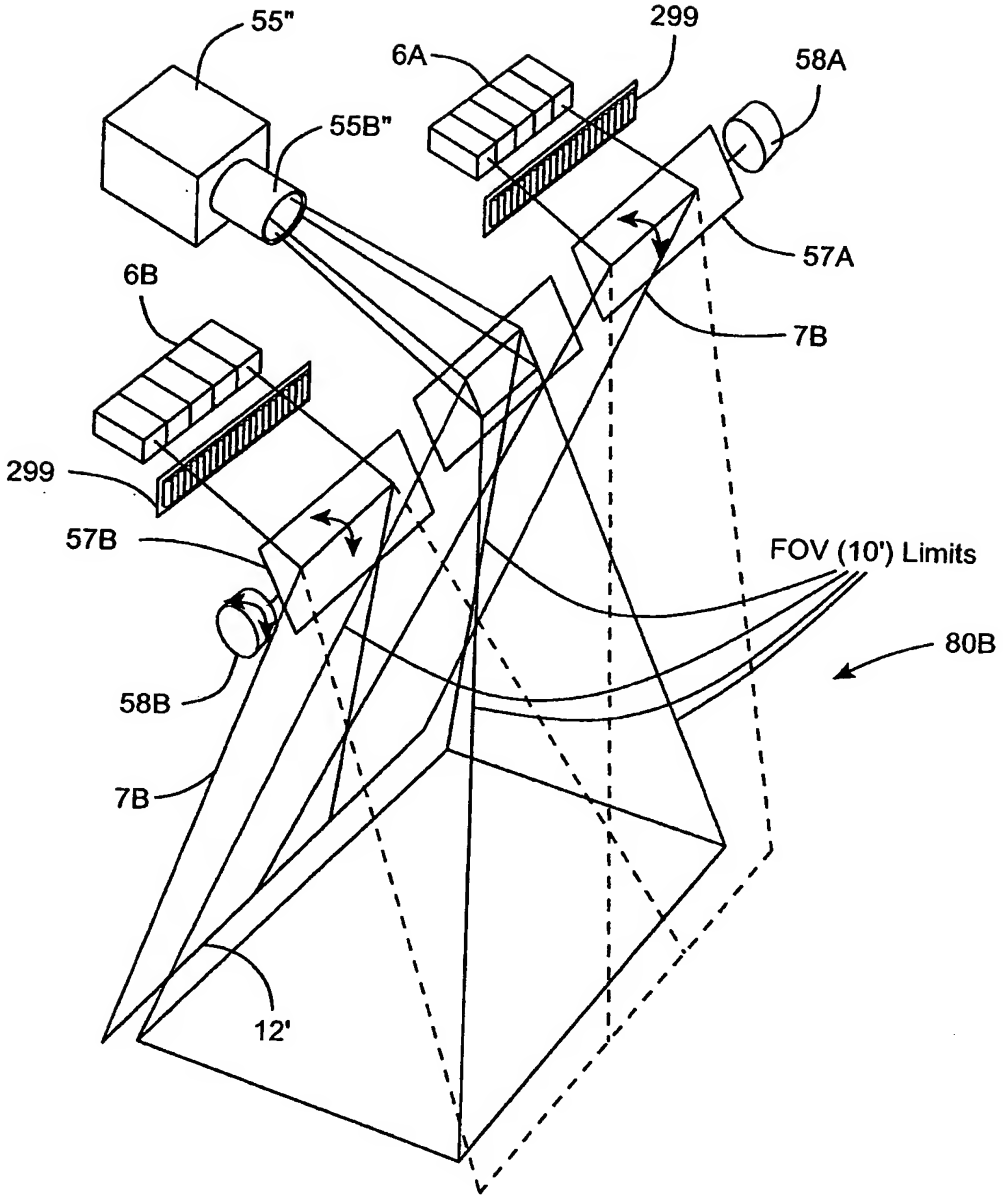


FIG. 6C1

(1) Variable Focal Length Camera Lens
(2) Variable Focal Distance

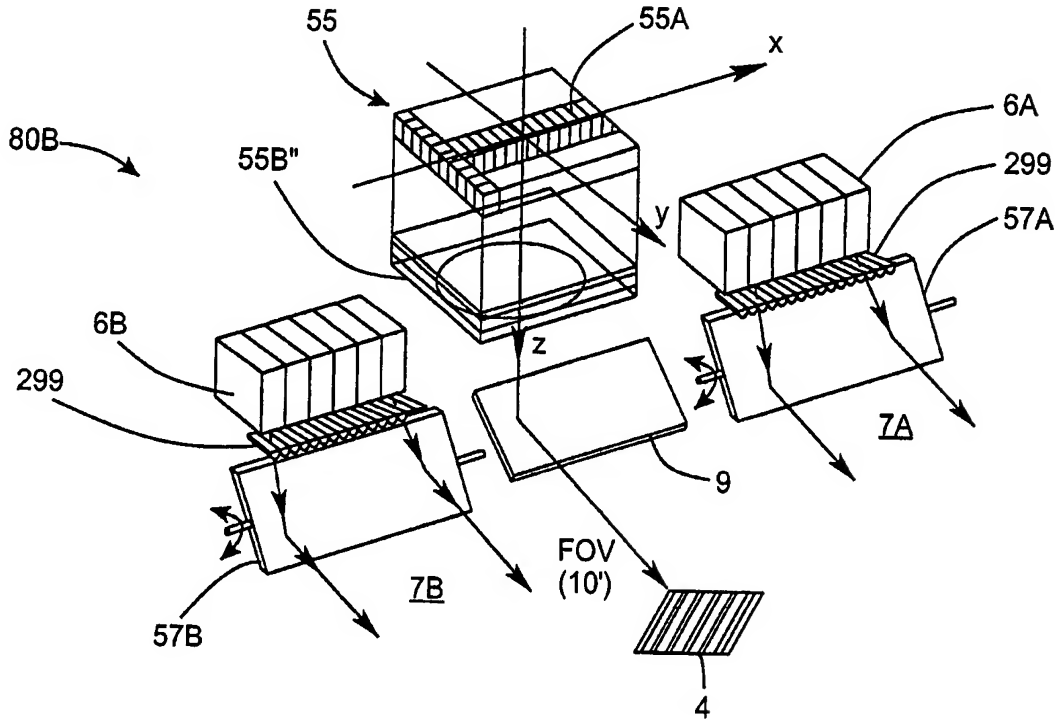


FIG. 6C2

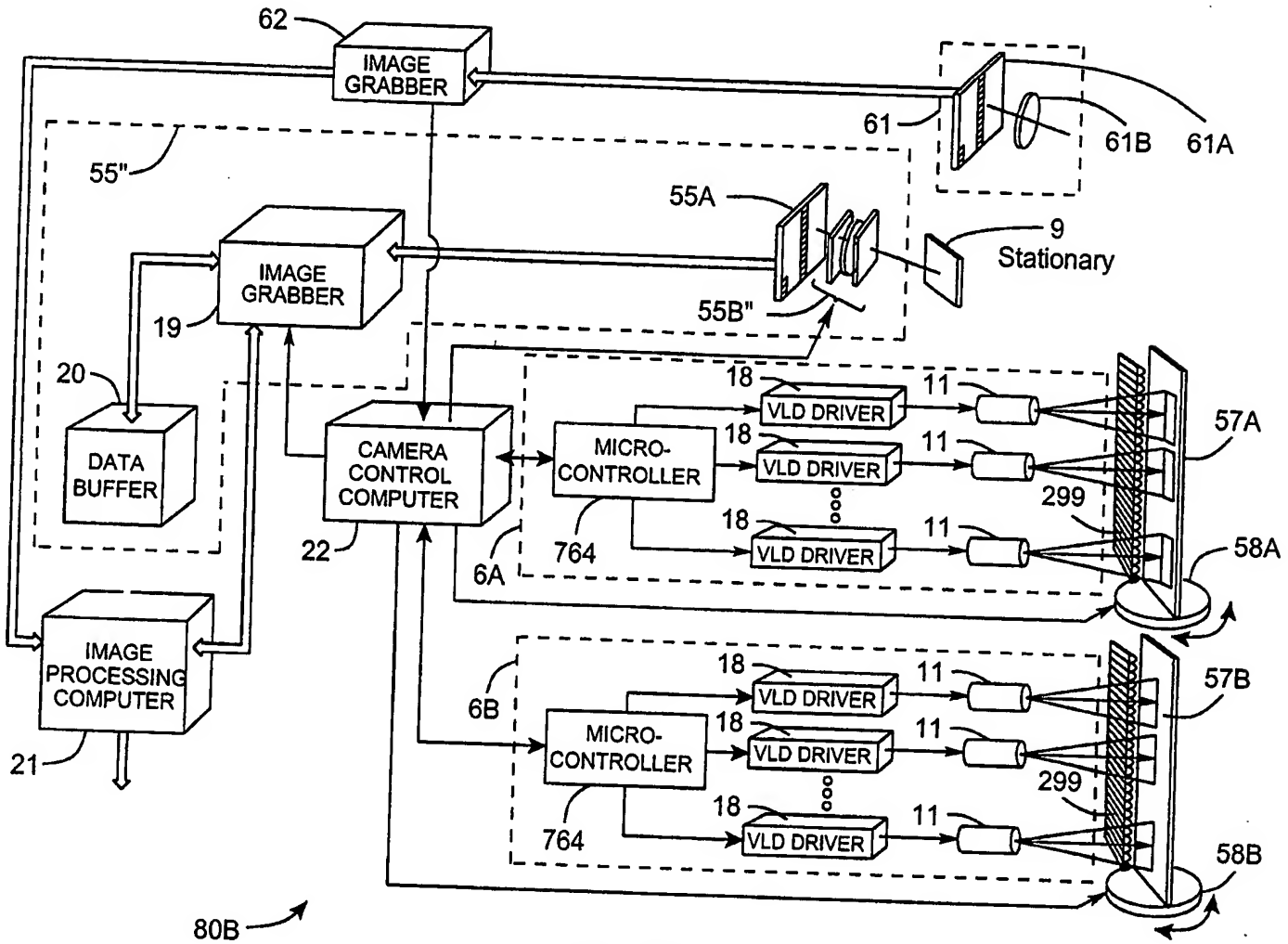


FIG. 6C3

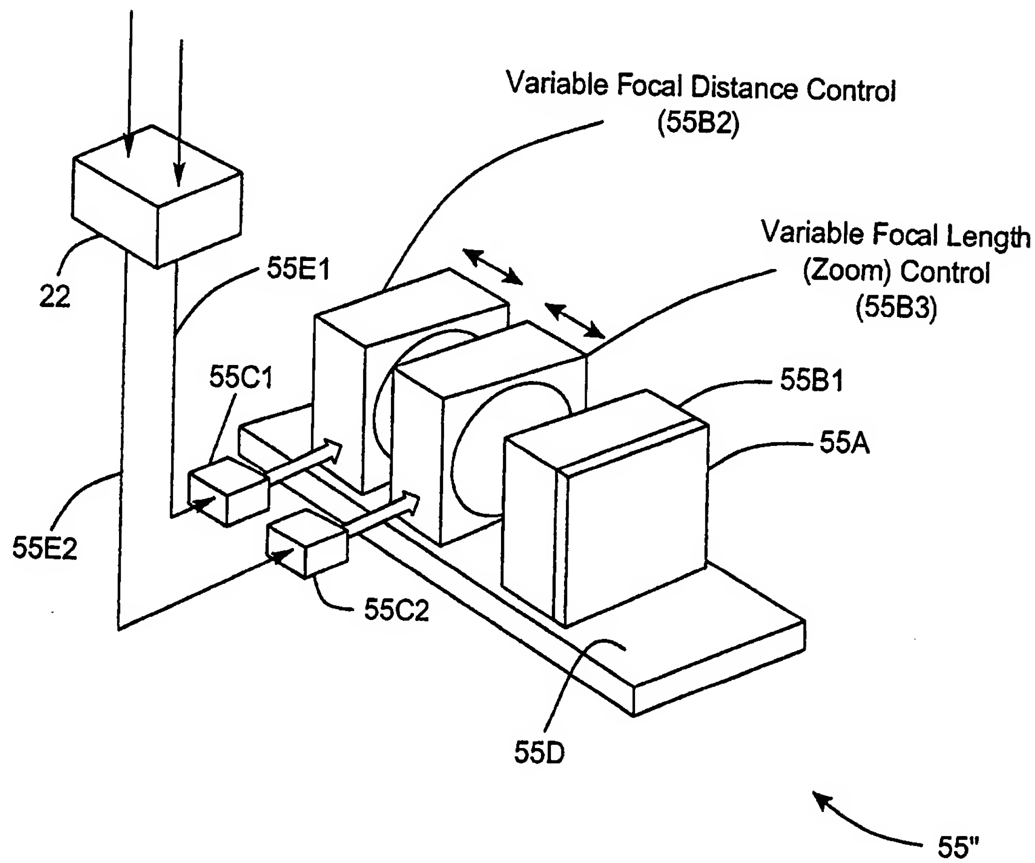

Variable Focal Distance Control
(55B2)
Variable Focal Length
(Zoom) Control
(55B3)
22
55E1
55C1
55B1
55A
55E2
55C2
55D
55"

FIG. 6C4

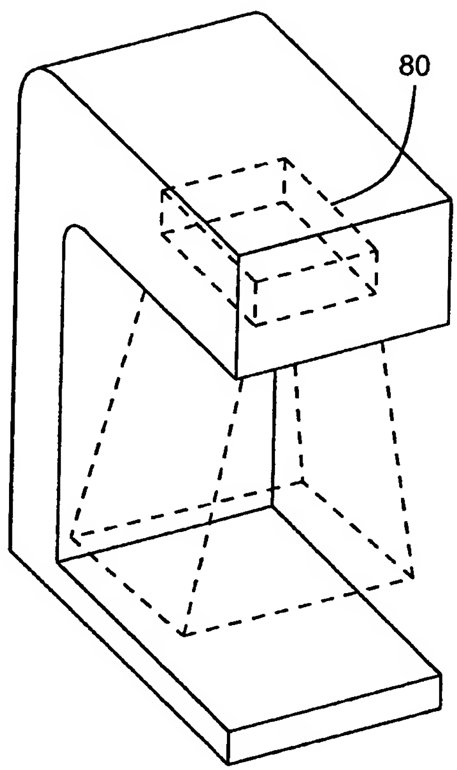


FIG. 6C5

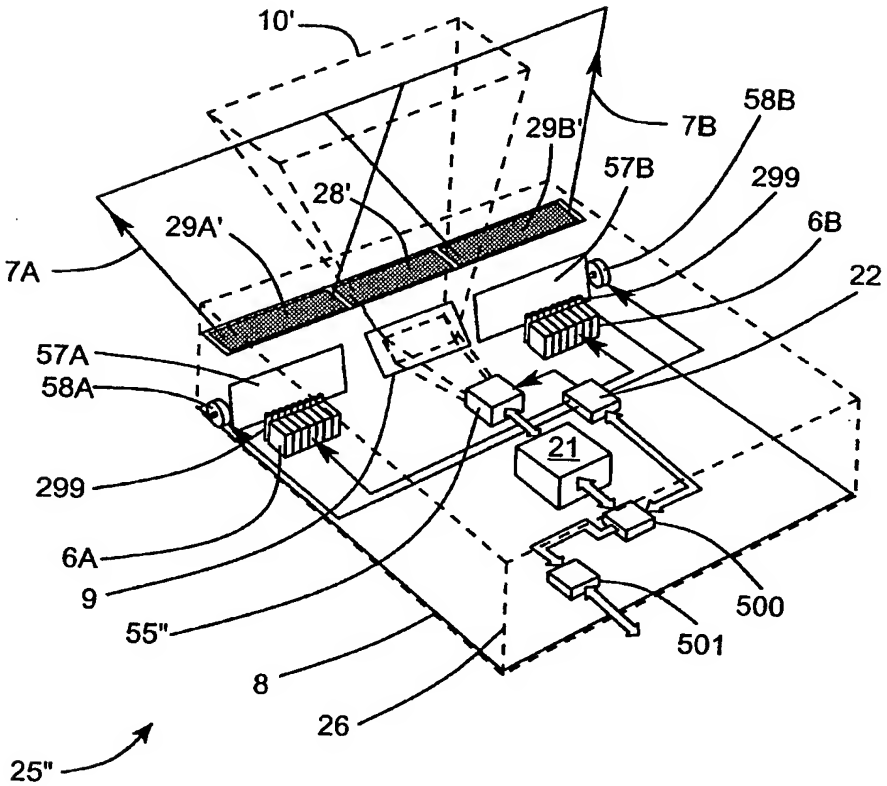


FIG. 6D1

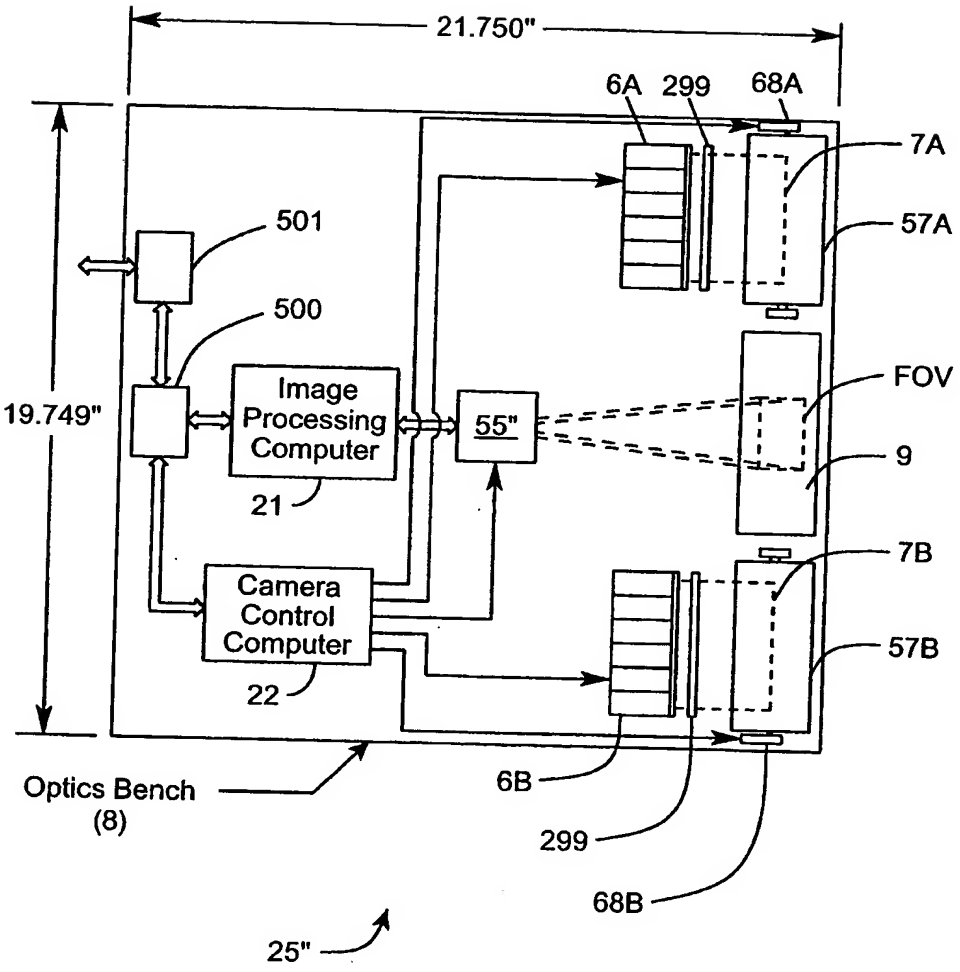
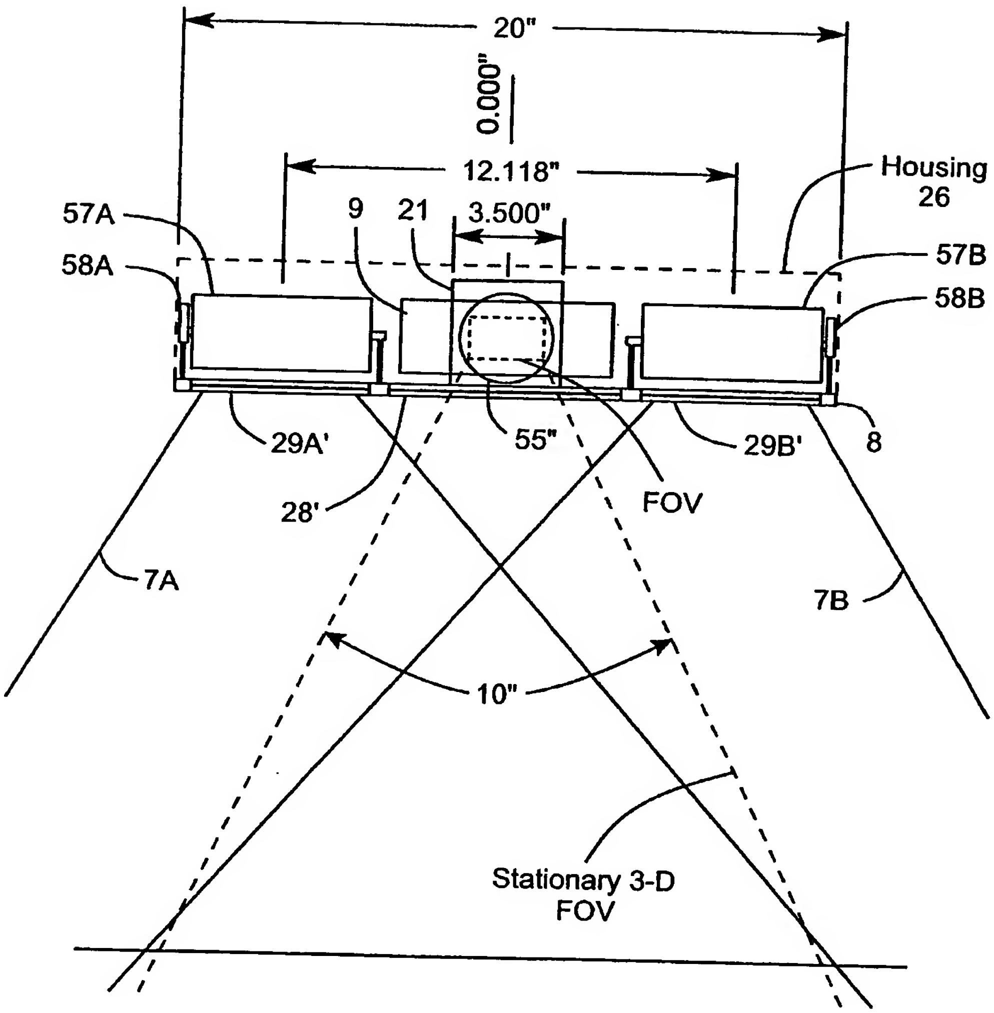

21.750"
6A
299
68A
7A
57A
501
500
19.749"
Image
Processing
Computer
21
55"
FOV
9
7B
Camera
Control
Computer
22
57B
Optics Bench
(8)
6B
299
68B
25"

FIG. 6D2



20"
0.000"
12.118"
Housing
26
57A
58A
9
21
3.500"
57B
58B
29A'
55"
29B'
8
28'
FOV
7A
7B
10"
Stationary 3-D
FOV

FIG. 6D3

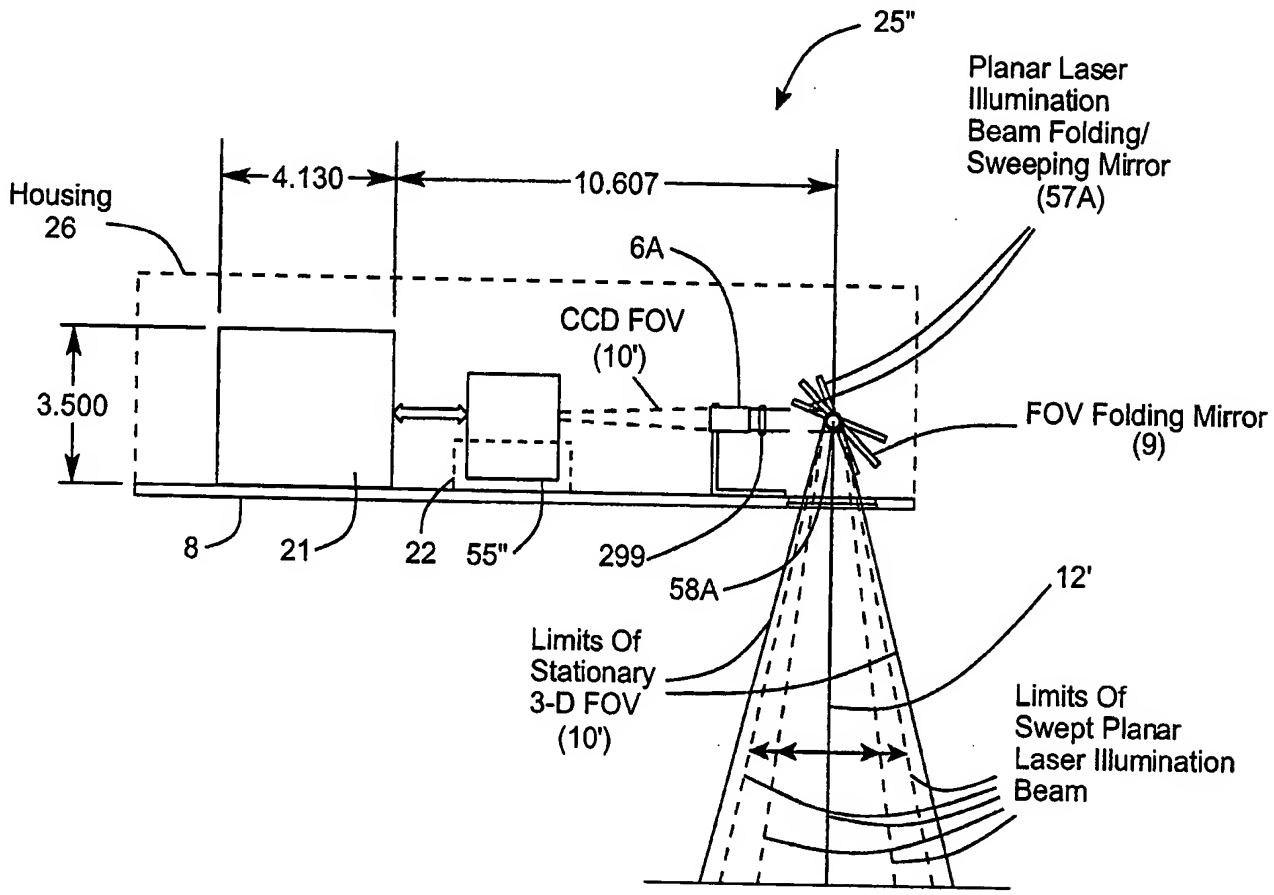


FIG. 6D4

* Variable FOV

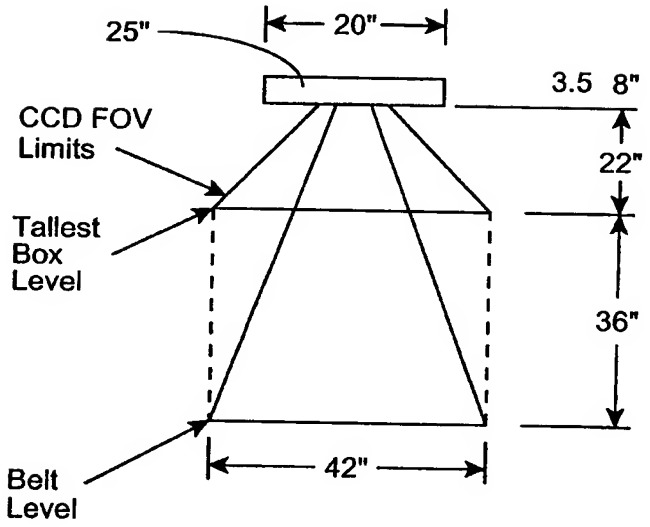


FIG. 6D5

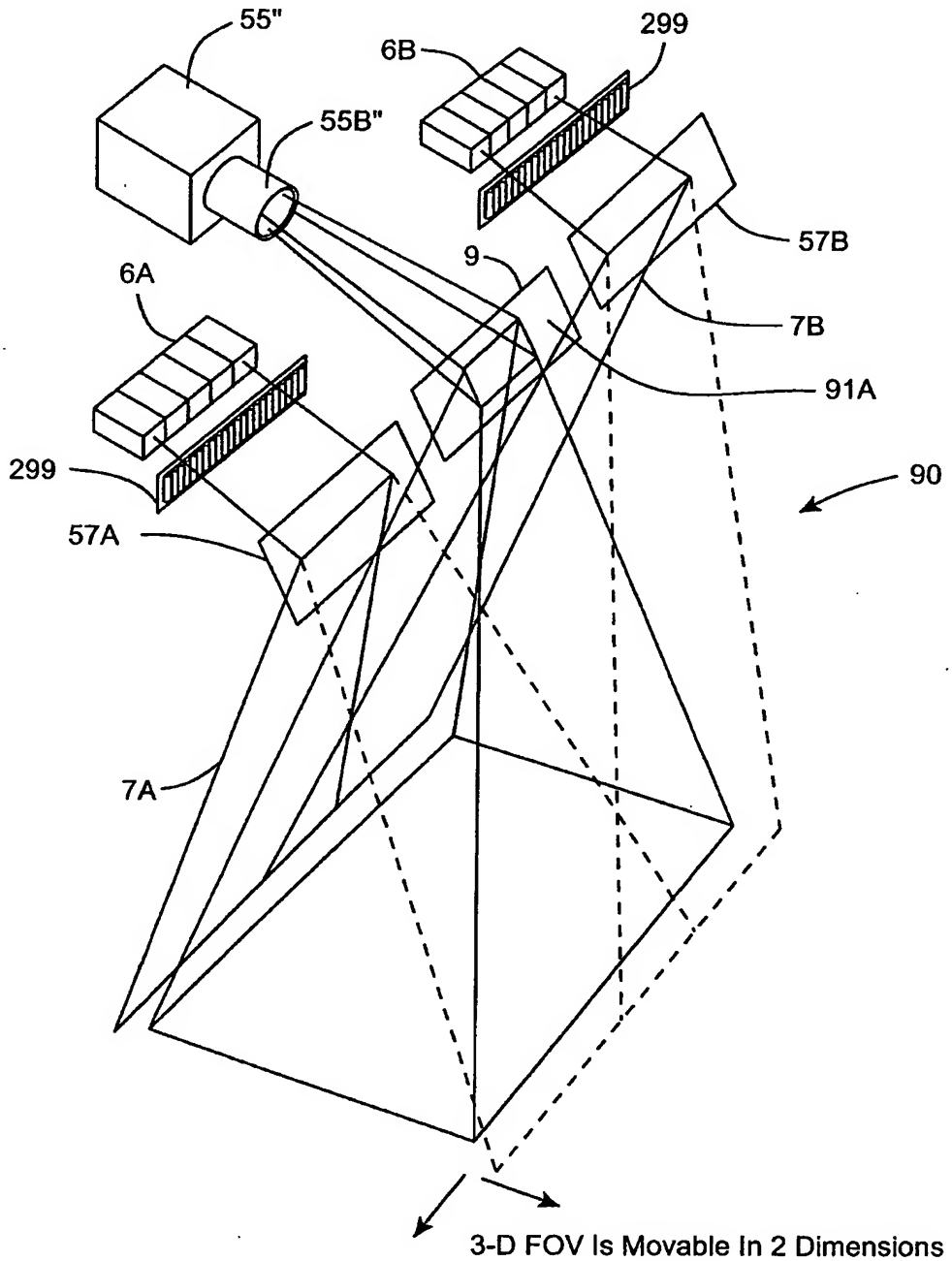

55"
6B
299
55B"
57B
9
6A
7B
91A
299
90
57A
7A
3-D FOV Is Movable In 2 Dimensions

FIG. 6E1

(1) Variable Focal Length Camera Lens
(2) Variable Focal Distance

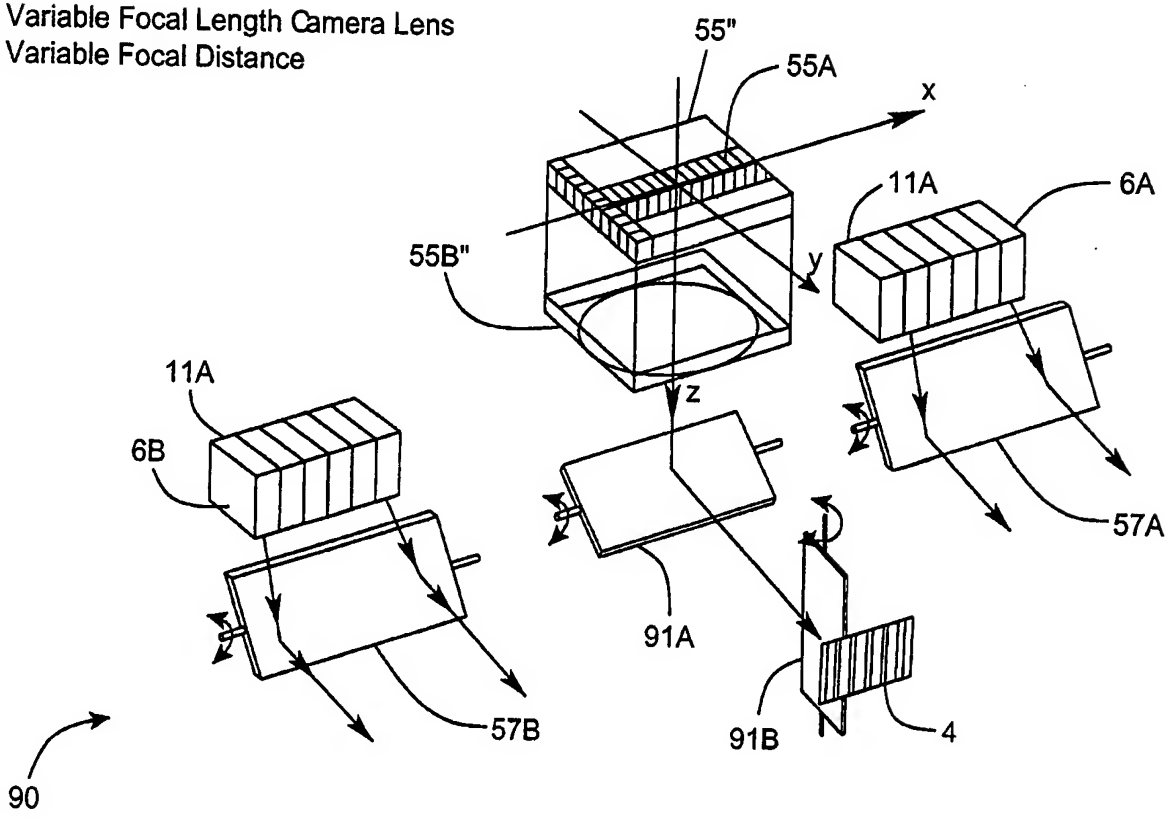


FIG. 6E2

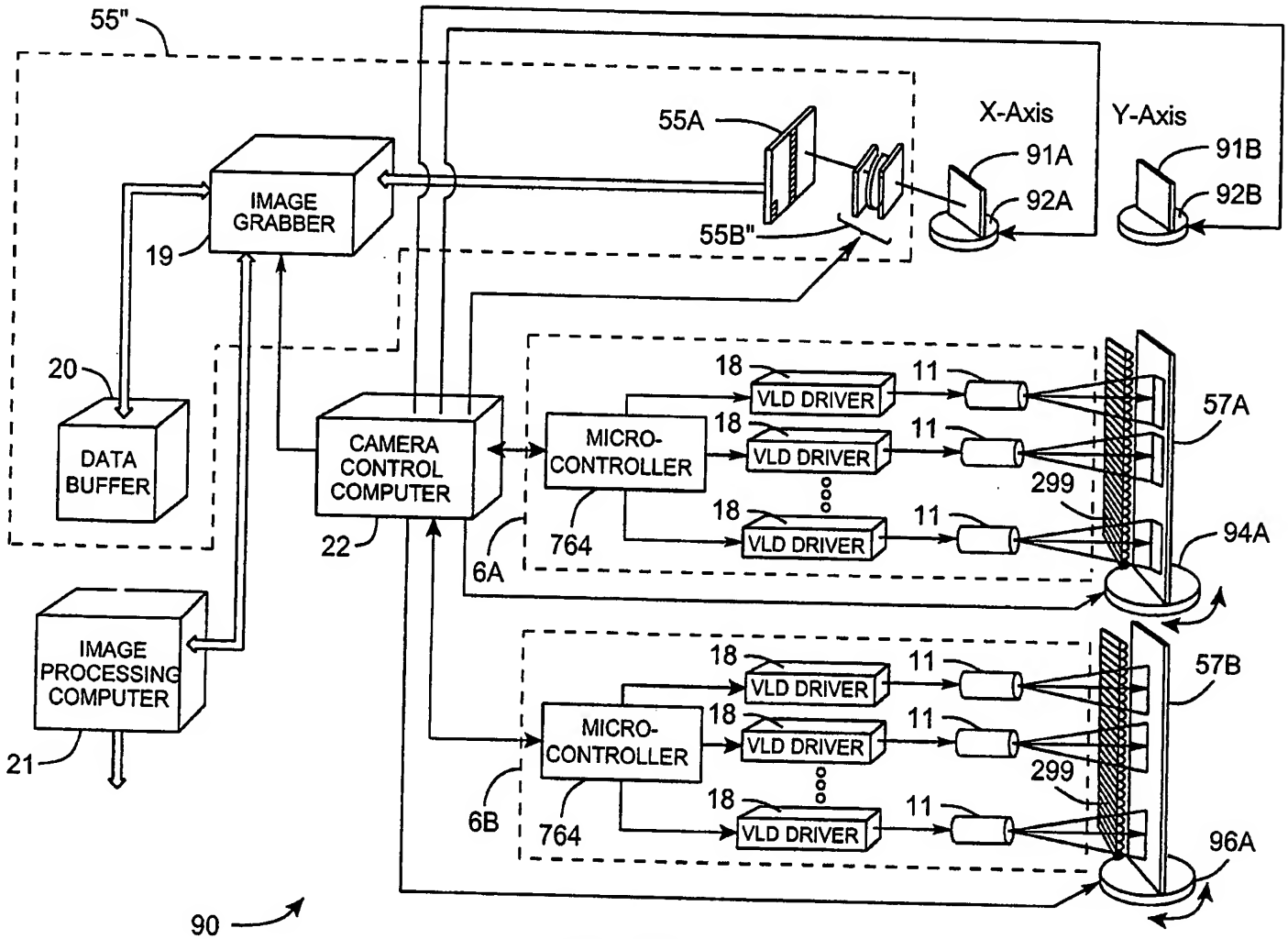


FIG. 6E3

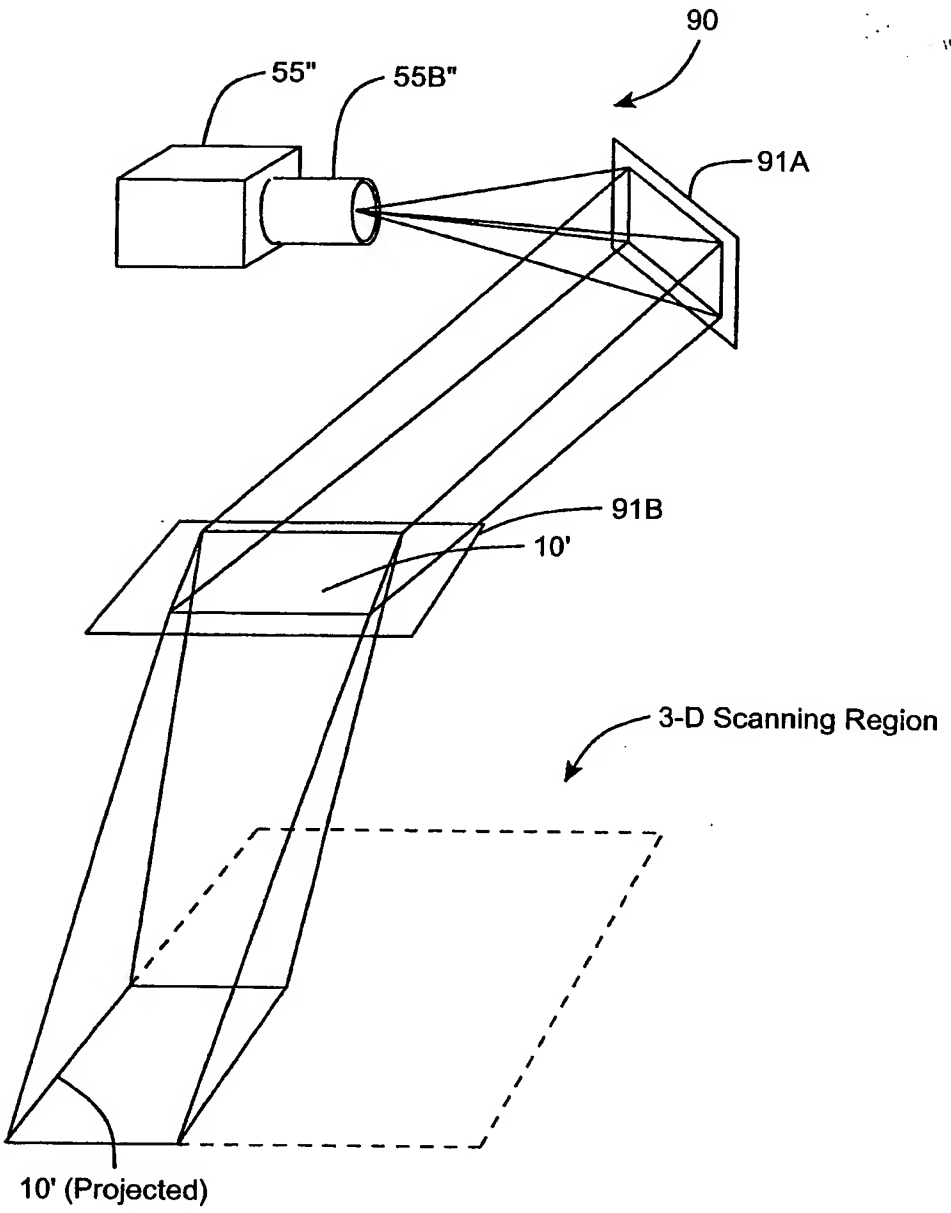


FIG. 6E4

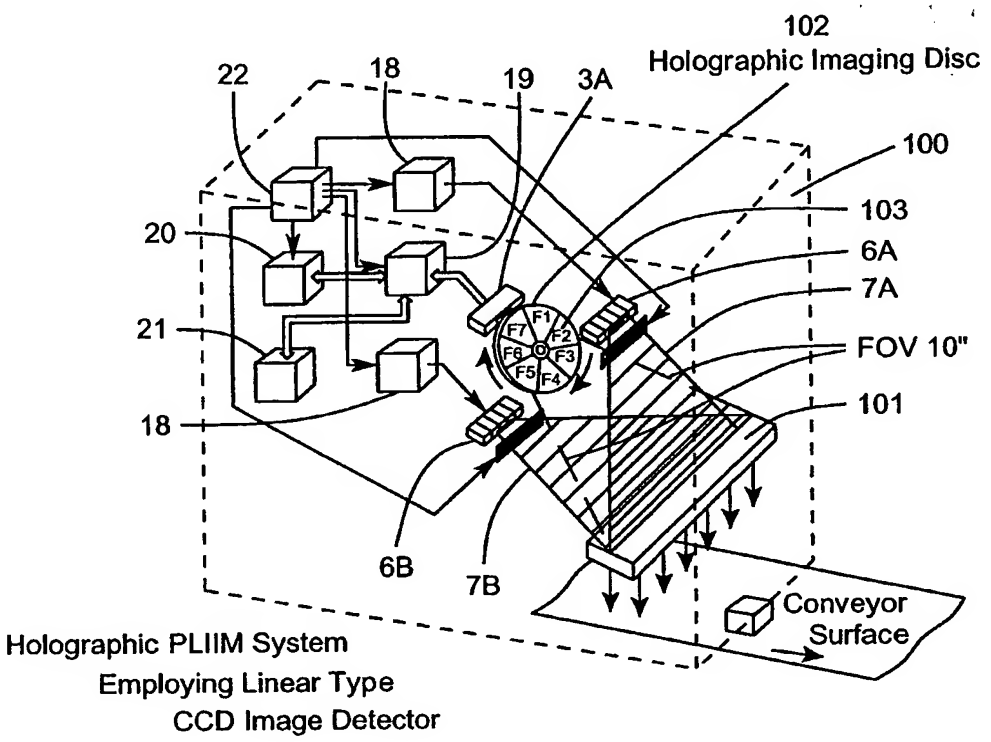

102
Holographic Imaging Disc
22
18
19
3A
100
103
20
6A
7A
21
F1
F2
F3
F4
F5
F6
F7
FOV 10"
101
18
6B
7B
Conveyor
Surface
Holographic PLIIM System
Employing Linear Type
CCD Image Detector

FIG. 7A

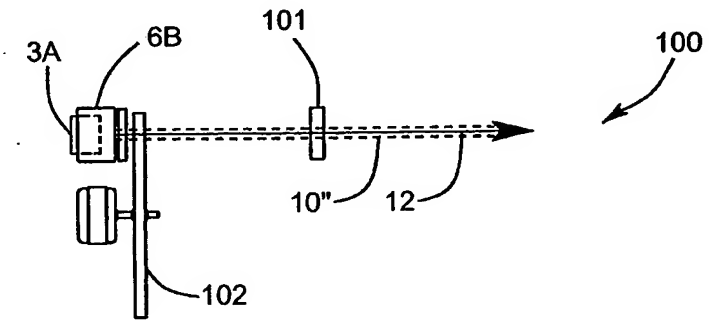

3A
6B
101
100
10"
12
102

FIG. 7B

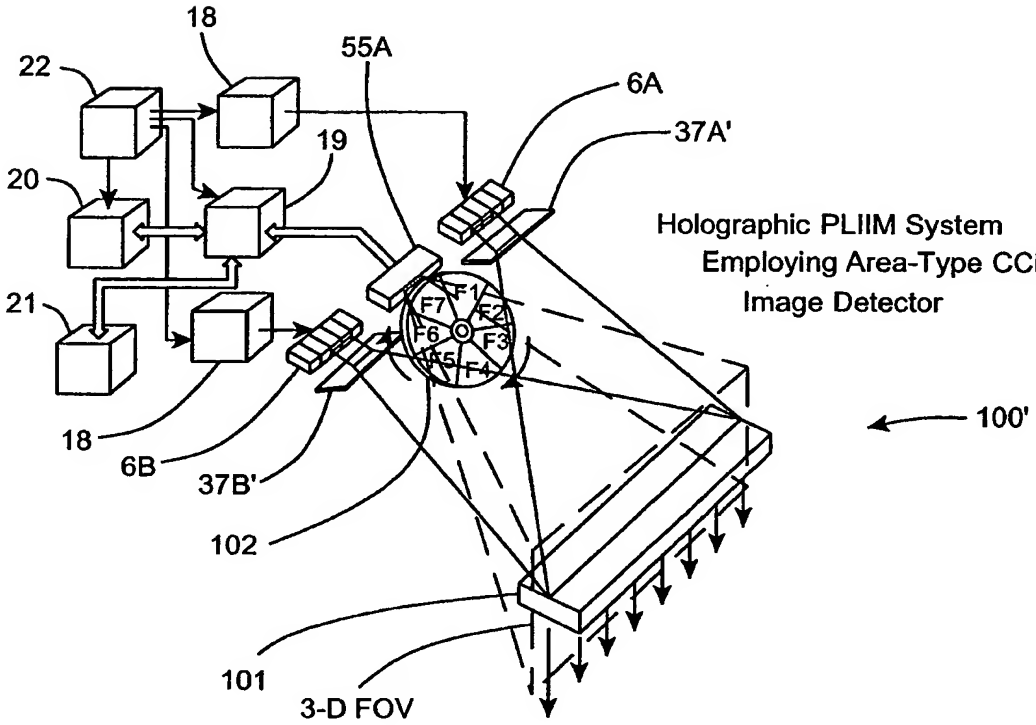

18
22
55A
6A
37A'
19
20
Holographic PLIIM System
Employing Area-Type CCD
Image Detector
21
F1
F2
F3
F4
F5
F6
F7
18
6B
37B'
100'
102
101
3-D FOV

FIG. 8A

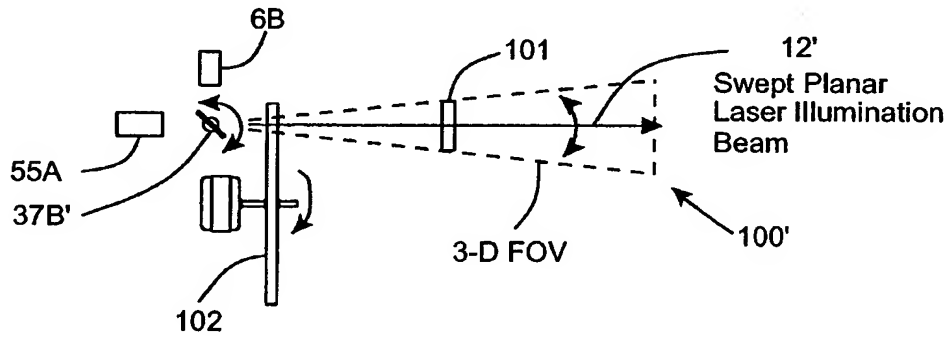

6B
101
12'
Swept Planar
Laser Illumination
Beam
55A
37B'
3-D FOV
100'
102

FIG. 8B

1-D Scanner Embodiment

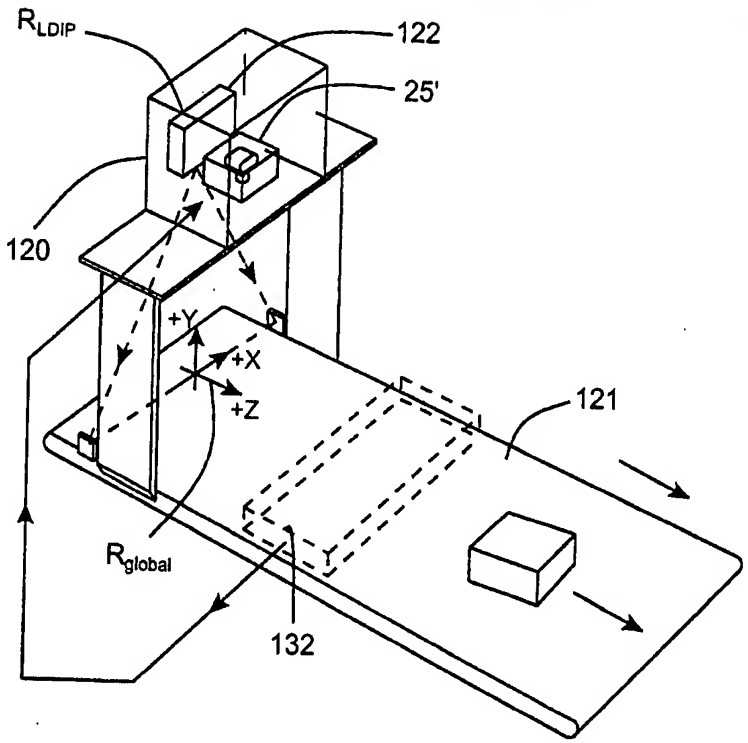


FIG. 9

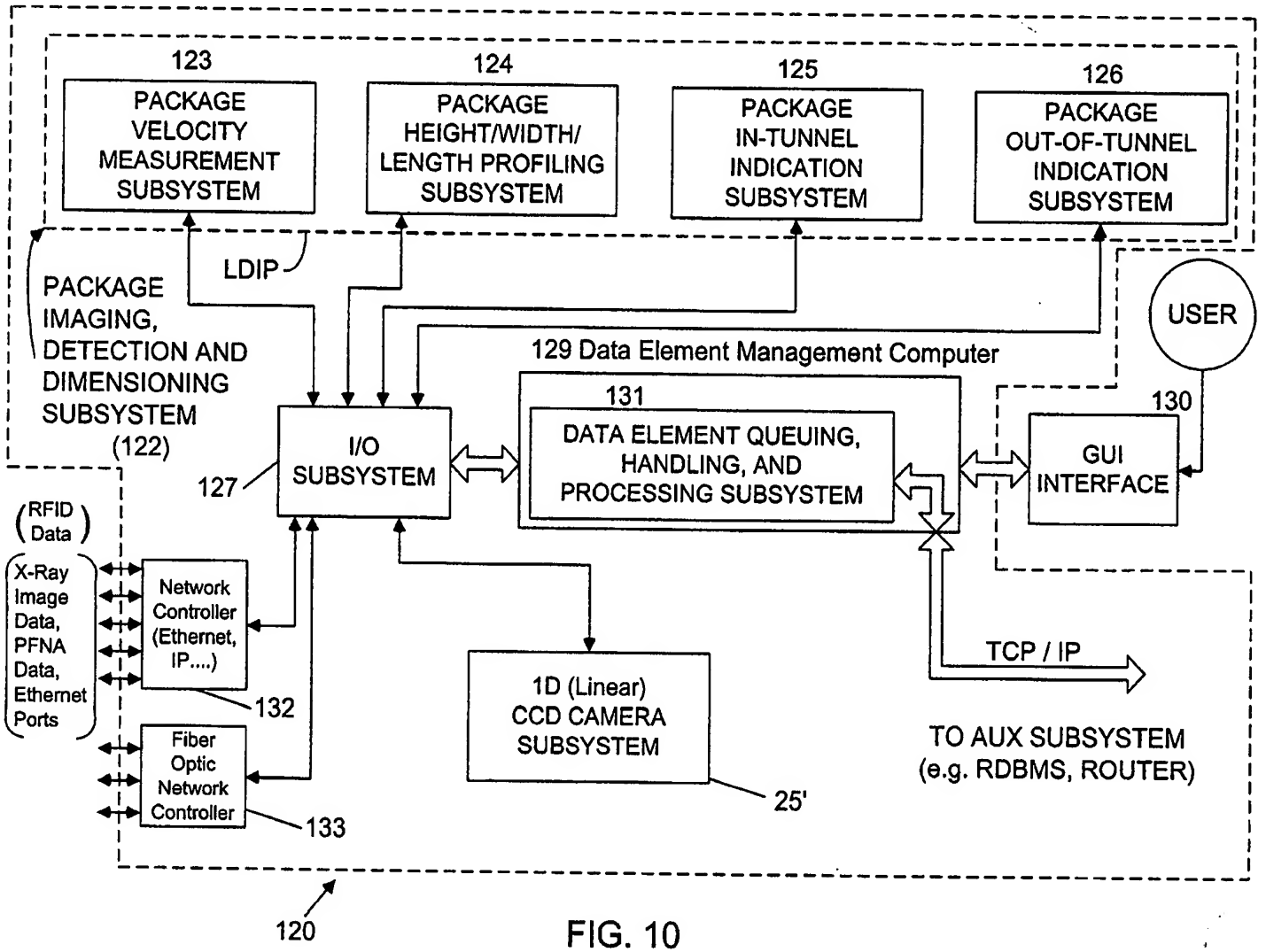


FIG. 10

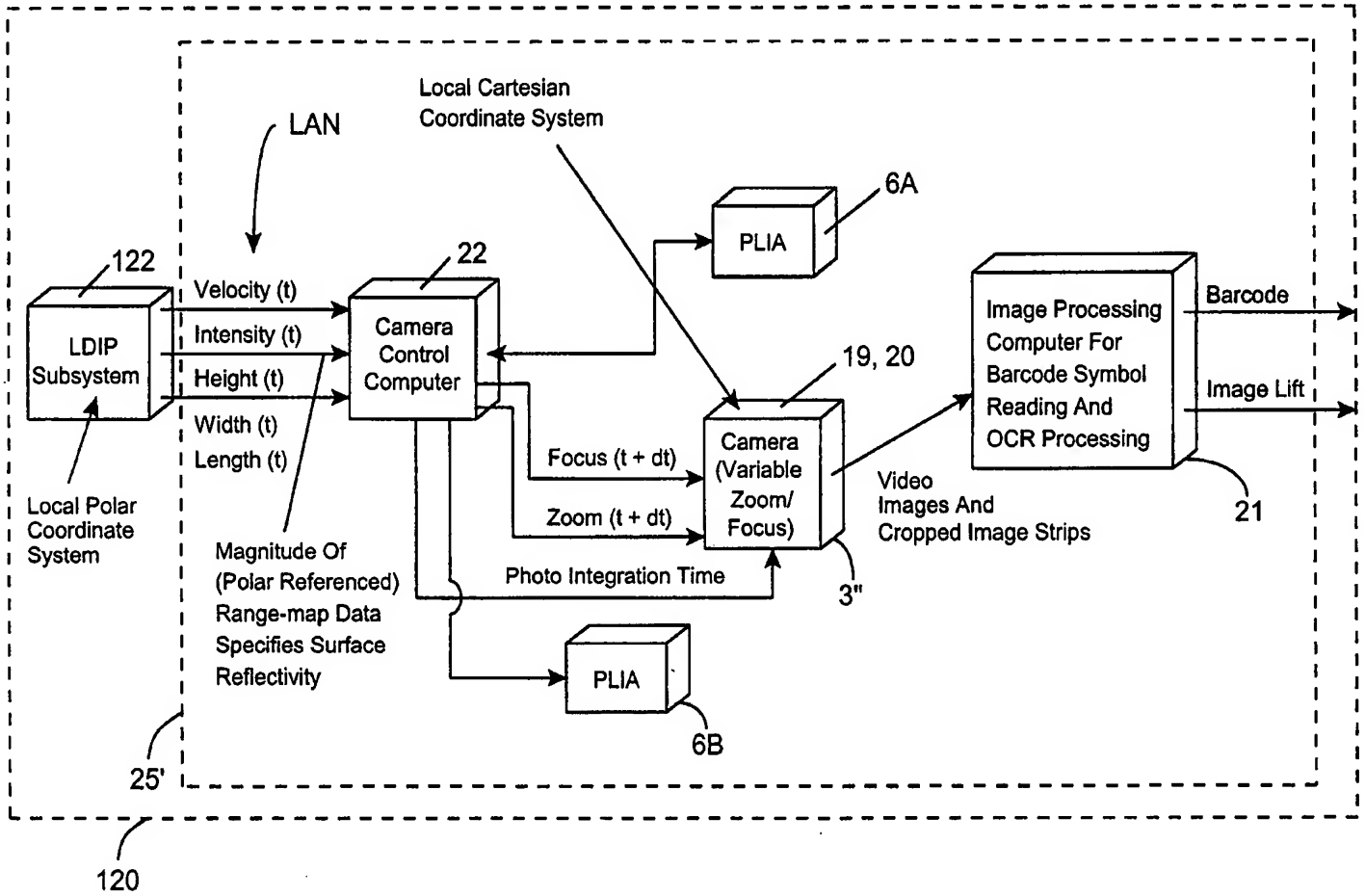

LAN
Local Cartesian
Coordinate System
6A
PLIA
122
22
Velocity (t)
Intensity (t)
Height (t)
Width (t)
Length (t)
LDIP
Subsystem
Camera
Control
Computer
19, 20
Image Processing
Computer For
Barcode Symbol
Reading And
OCR Processing
Barcode
Image Lift
Focus (t + dt)
Zoom (t + dt)
Camera
(Variable
Zoom/
Focus)
Video
Images And
Cropped Image Strips
21
Local Polar
Coordinate
System
Magnitude Of
(Polar Referenced)
Range-map Data
Specifies Surface
Reflectivity
Photo Integration Time
3"
PLIA
6B
25'
120

FIG. 11

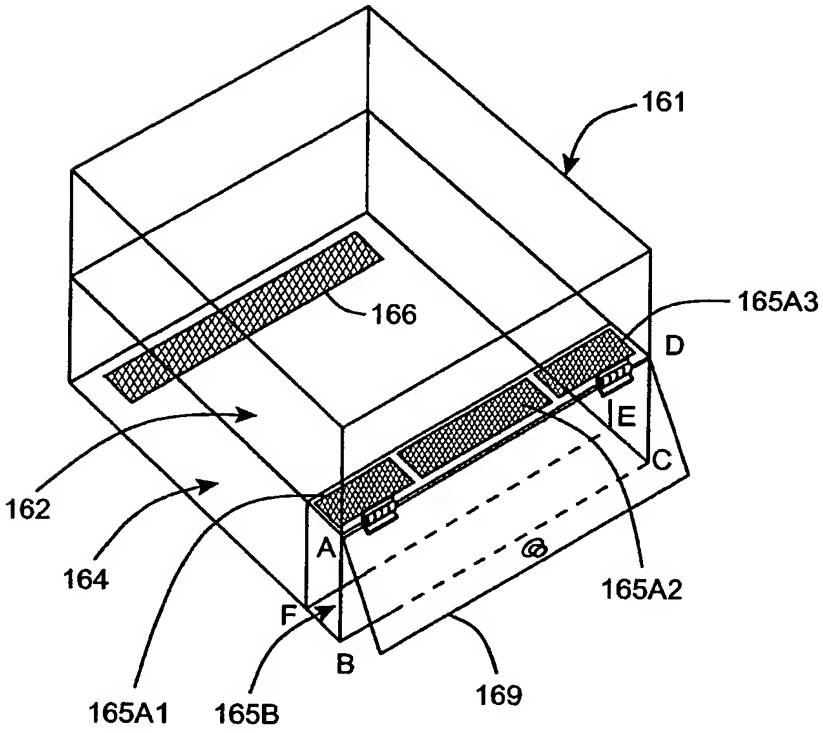


FIG. 12A

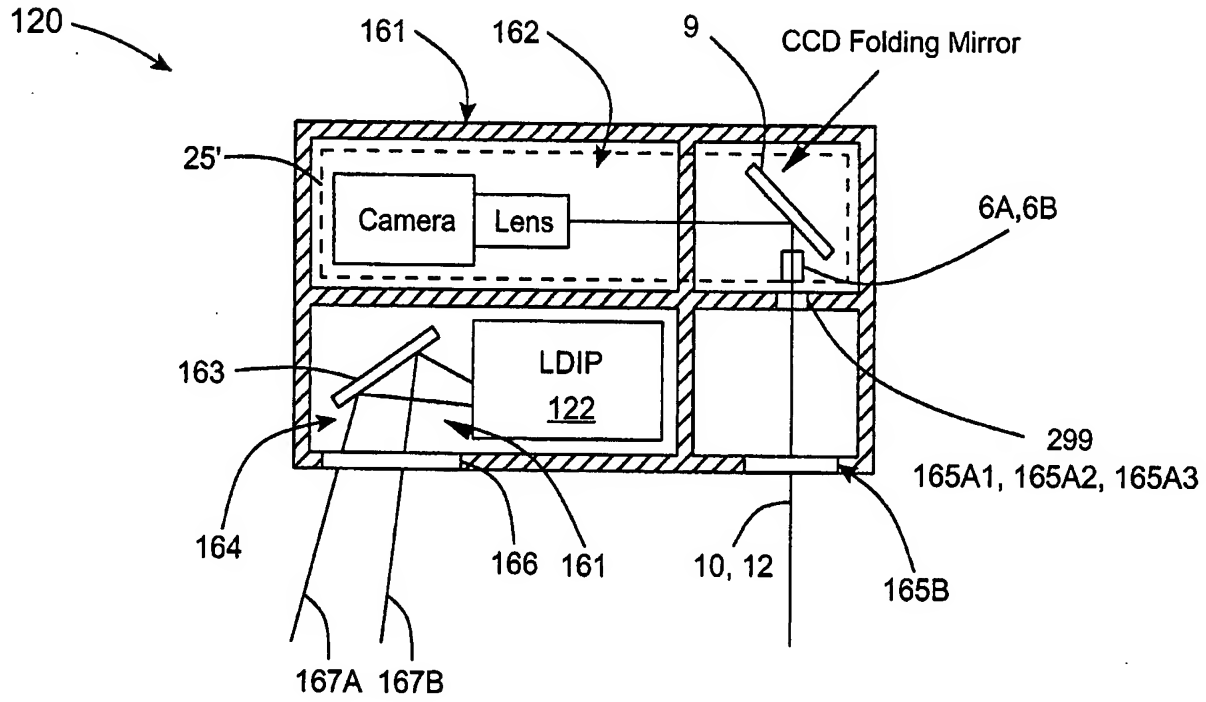


FIG. 12B

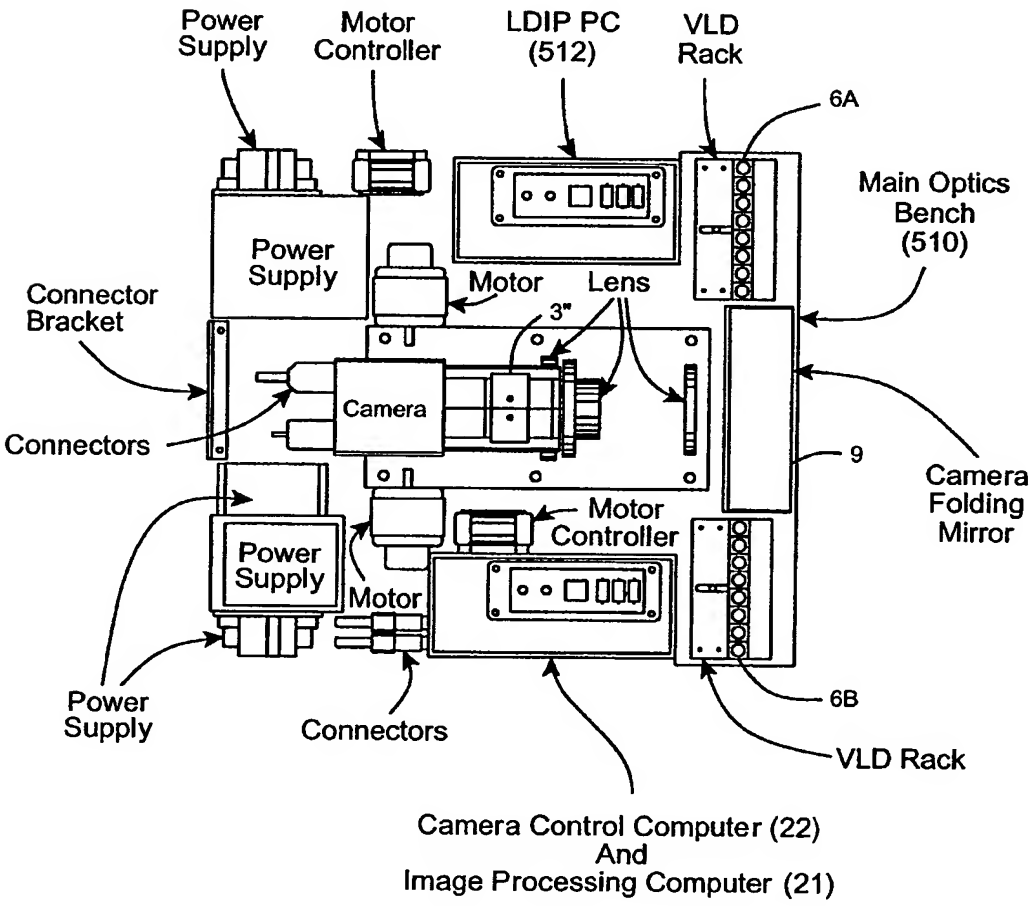

Power Supply
Motor Controller
LDIP PC (512)
VLD Rack
6A
Main Optics Bench (510)
Power Supply
Motor
Lens
3"
Connector Bracket
Camera
Connectors
9
Camera Folding Mirror
Motor Controller
Power Supply
Motor
6B
Power Supply
Connectors
VLD Rack
Camera Control Computer (22)
And
Image Processing Computer (21)

FIG. 12C

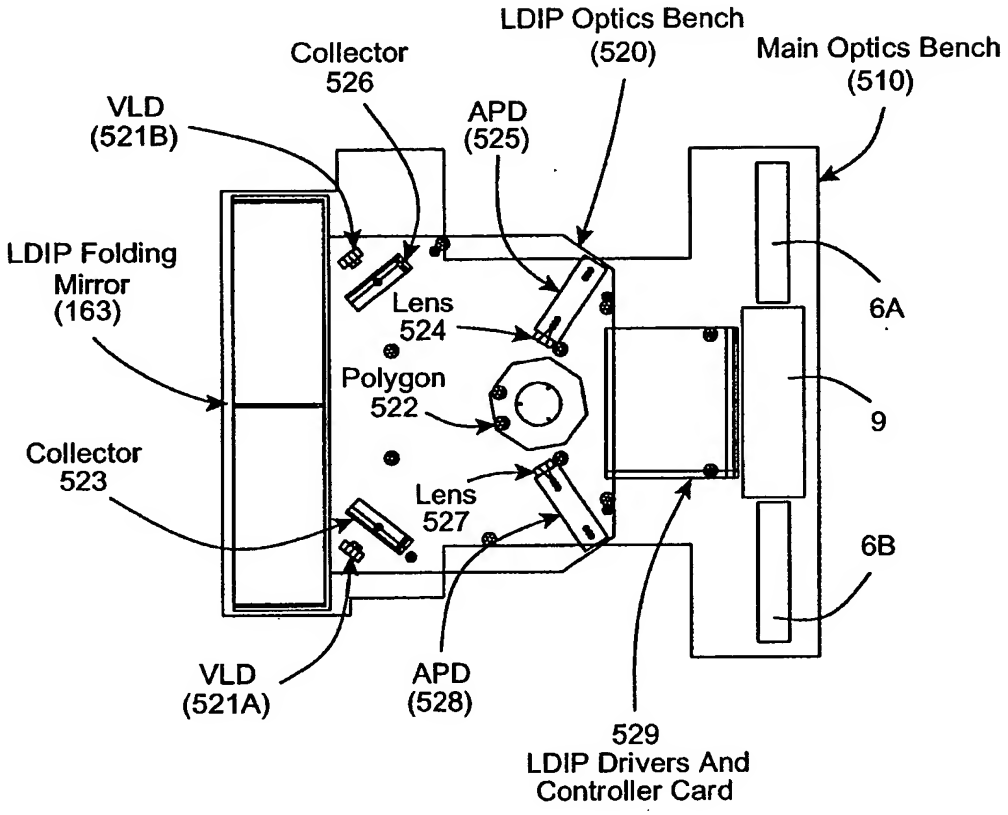

LDIP Optics Bench
(520)
Collector
526
Main Optics Bench
(510)
VLD
(521B)
APD
(525)
LDIP Folding
Mirror
(163)
Lens
524
6A
Polygon
522
9
Collector
523
Lens
527
6B
VLD
(521A)
APD
(528)
529
LDIP Drivers And
Controller Card

FIG. 12D

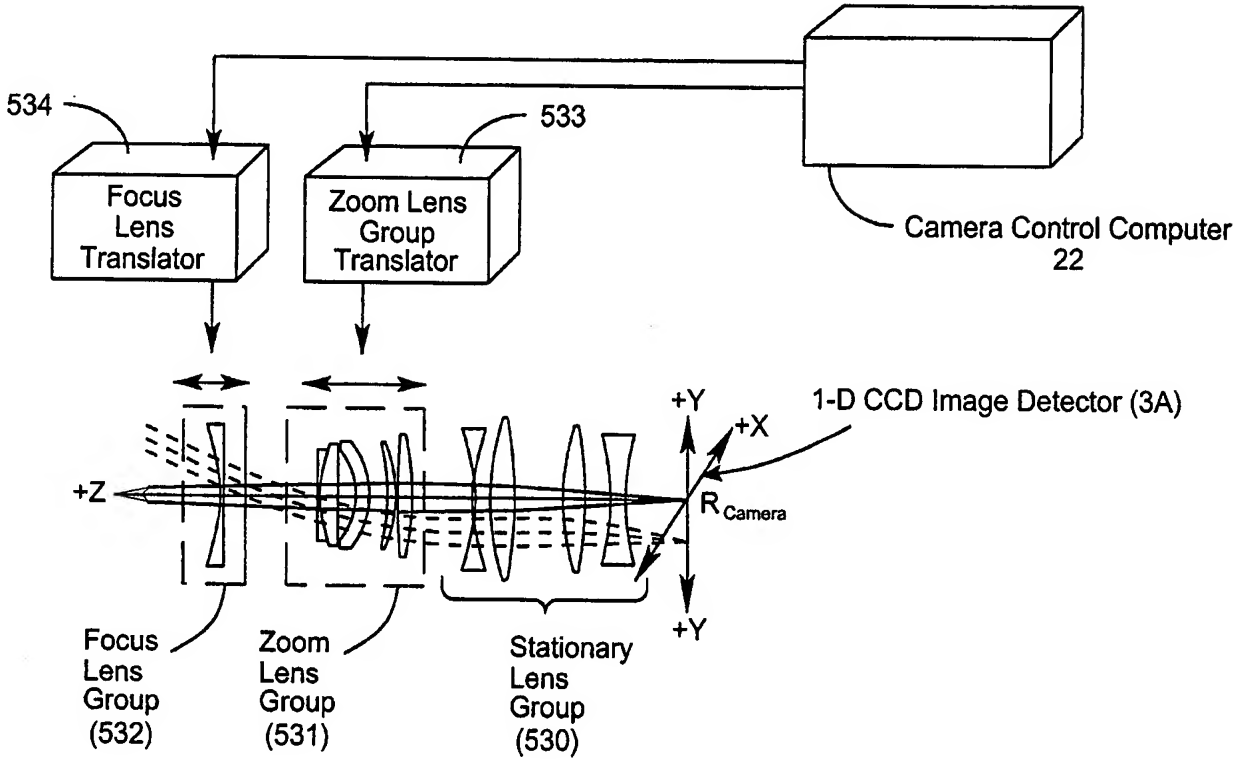


FIG. 12E

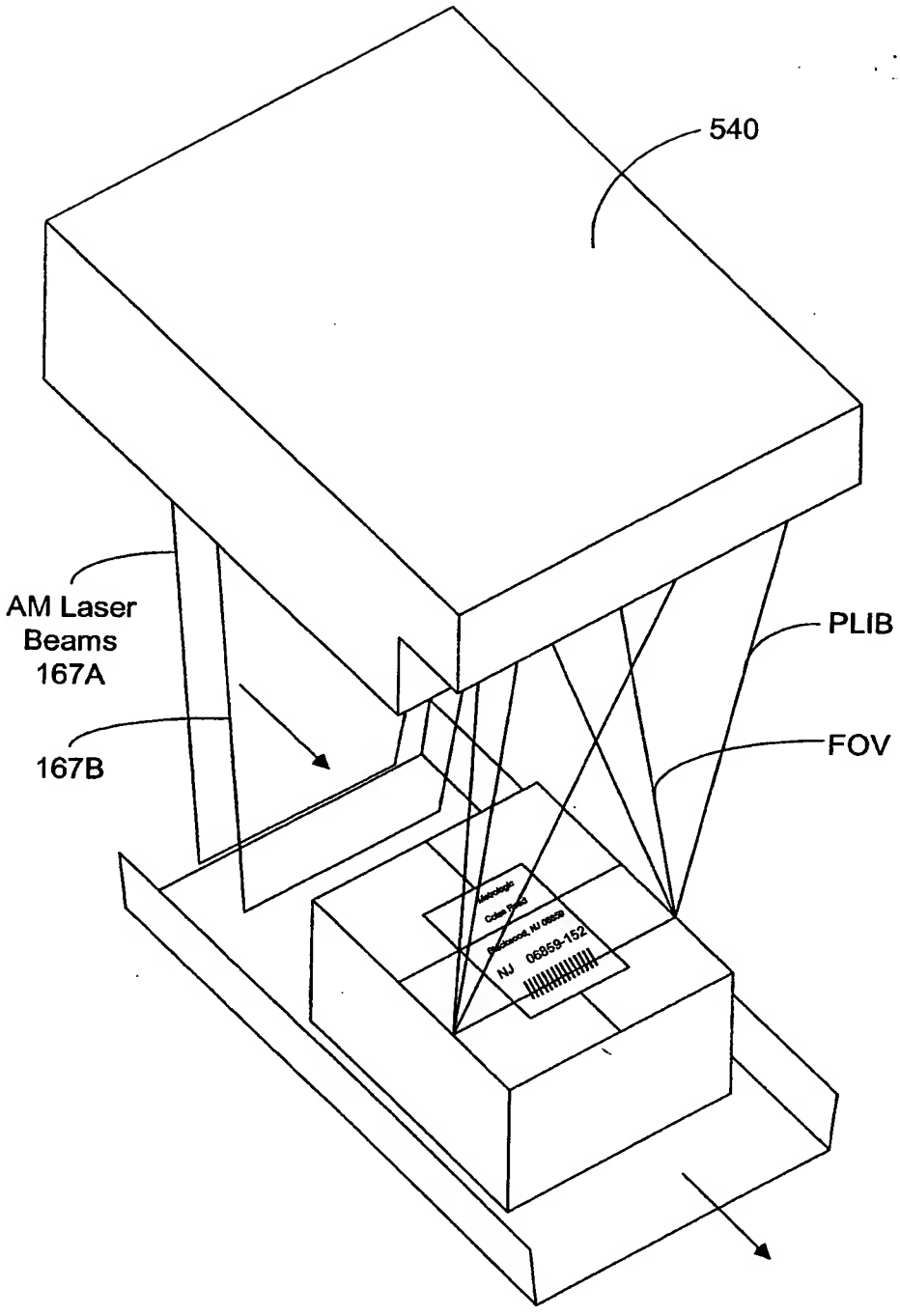


FIG. 13A

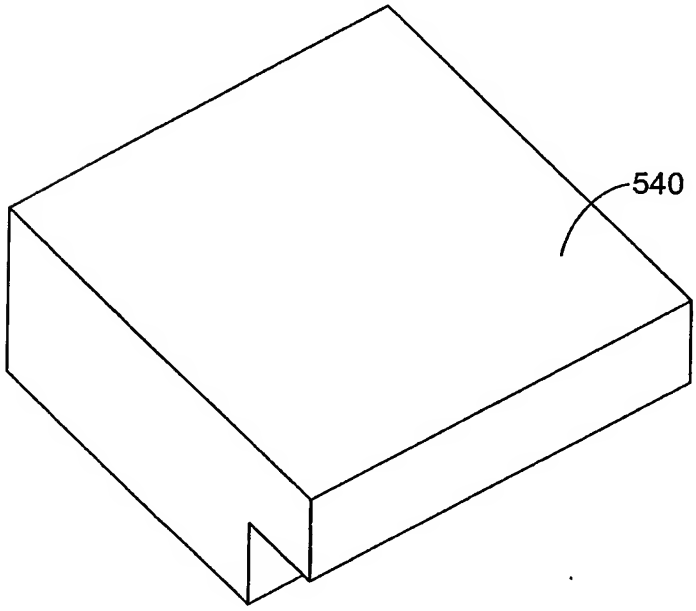


FIG. 13B

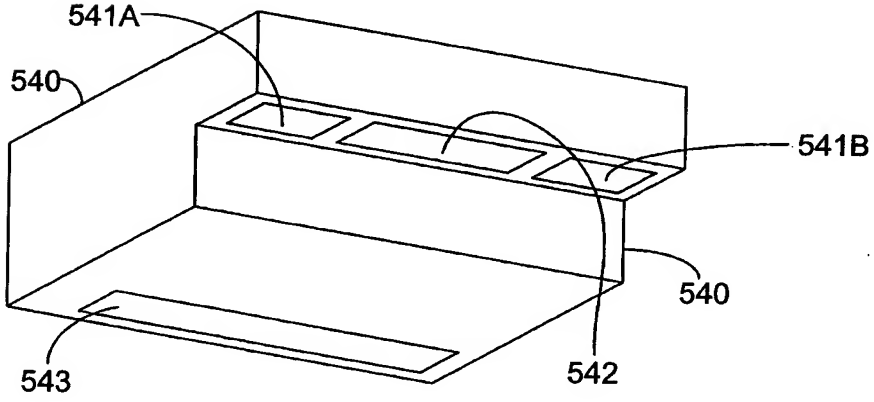


FIG. 13C

PLIIM-BASED PACKAGE IDENTIFICATION AND DIMENSIONING (PID) SYSTEM

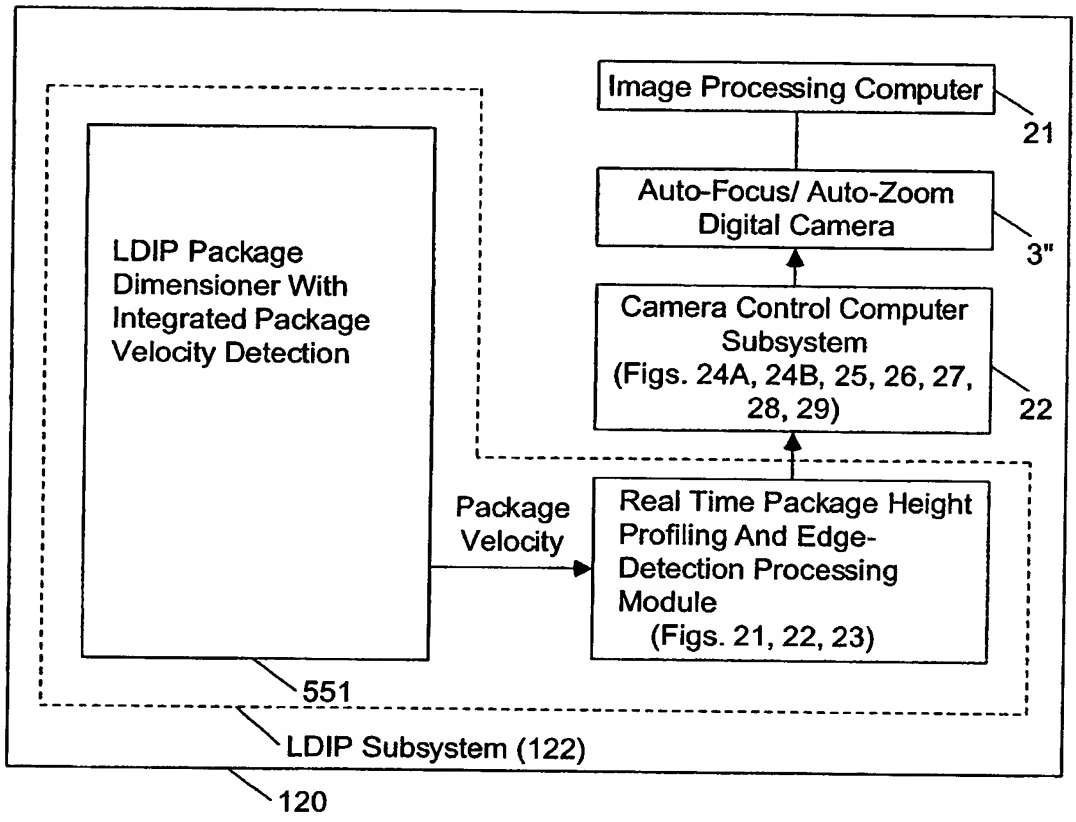


FIG. 14

LDIP REAL-TIME PACKAGE HEIGHT PROFILE AND EDGE DETECTION METHOD

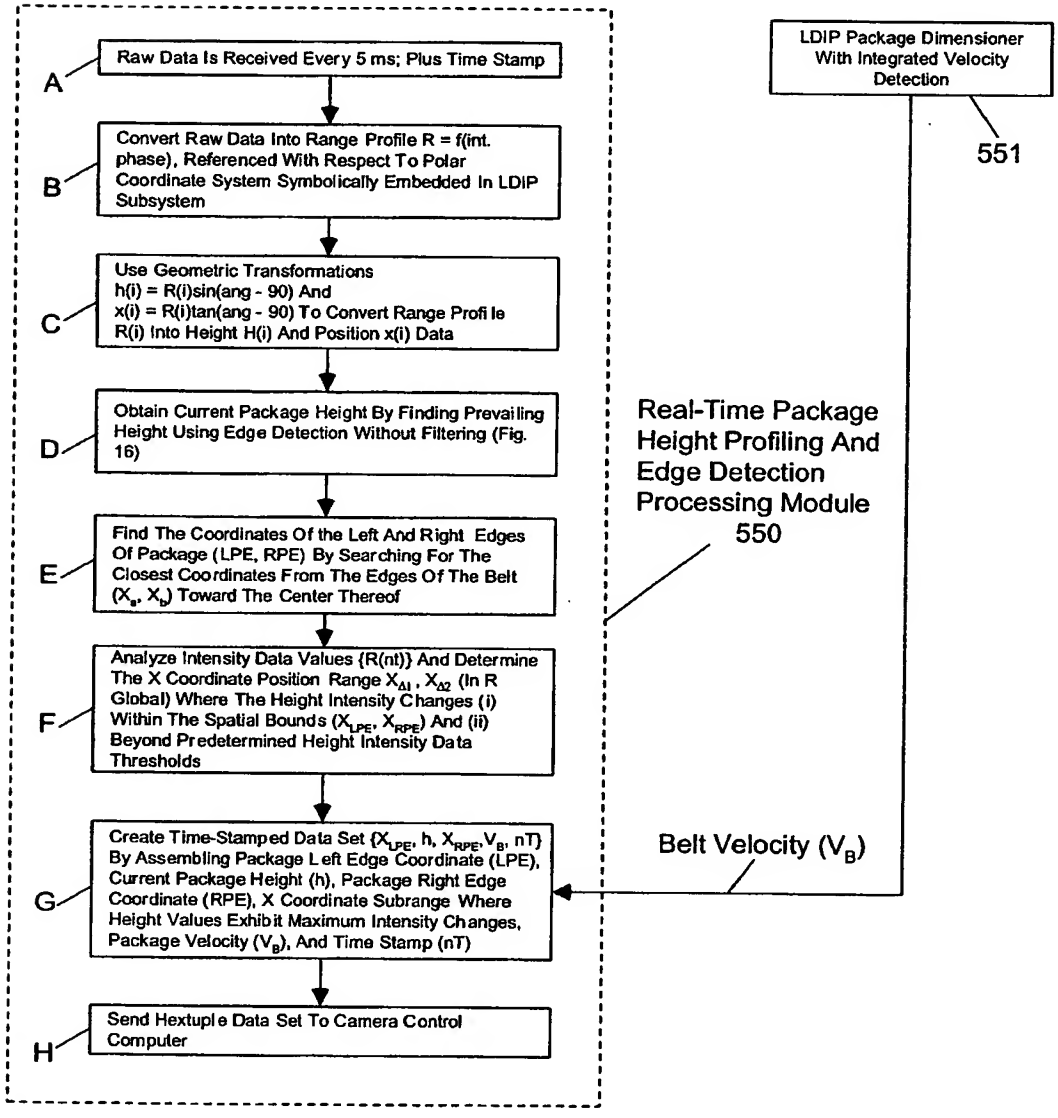
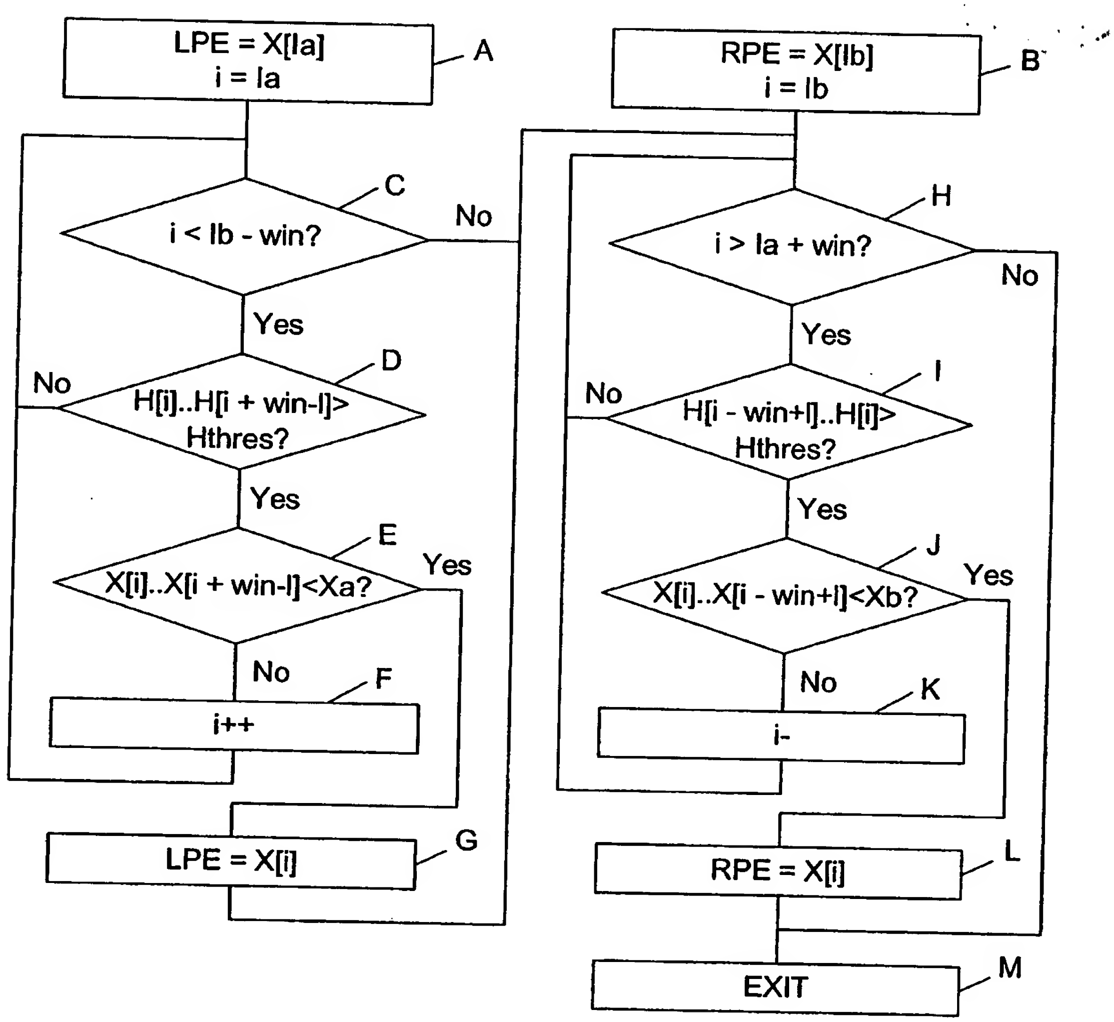


FIG. 15

LDIP REAL-TIME PACKAGE EDGE DETECTION



Xa = Location Of Belt Left Edge; Xb = Location Of Belt Right Edge
Ia = Belt Left Edge Pixel; Ib = Belt Right Edge Pixel
LPE = Left package Edge; RPE = Right Package Edge
H[] = Pixel Height Array; X[] = Pixel Location Array
win = Package detection Window

FIG. 16

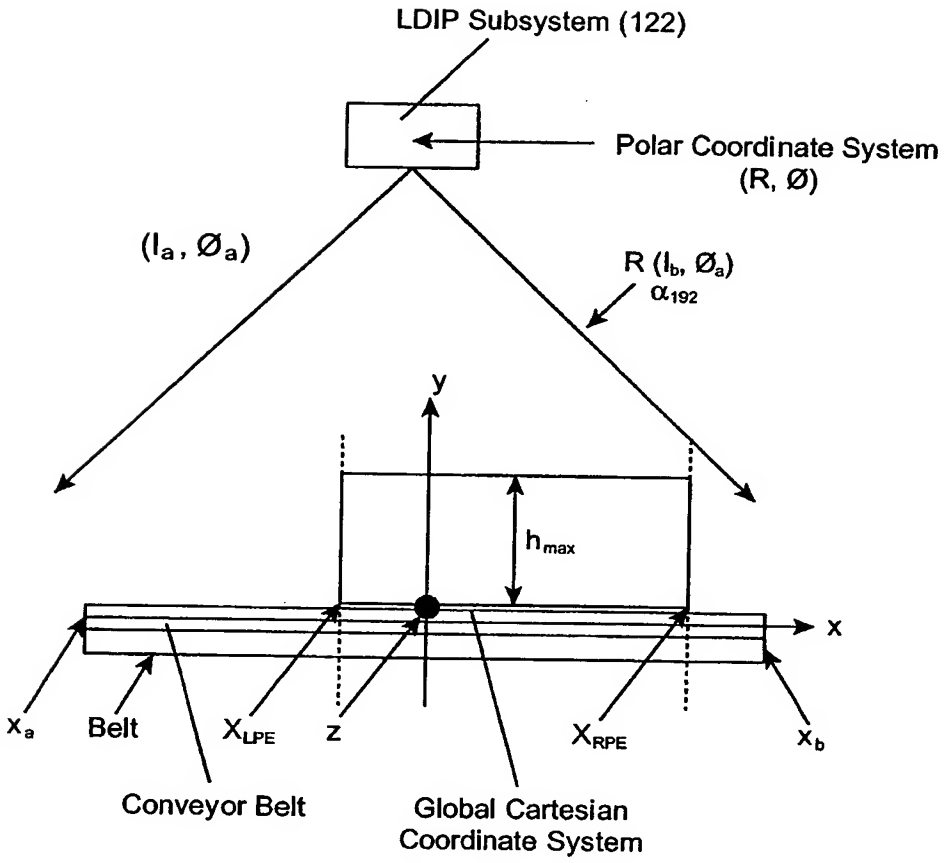

LDIP Subsystem (122)
Polar Coordinate System
(R, Ø)
$(l_a, Ø_a)$
R $(l_b, Ø_a)$
α_{192}
y
h_{max}
x
x_a
Belt
X_{LPE}
z
X_{RPE}
x_b
Conveyor Belt
Global Cartesian
Coordinate System

FIG. 17

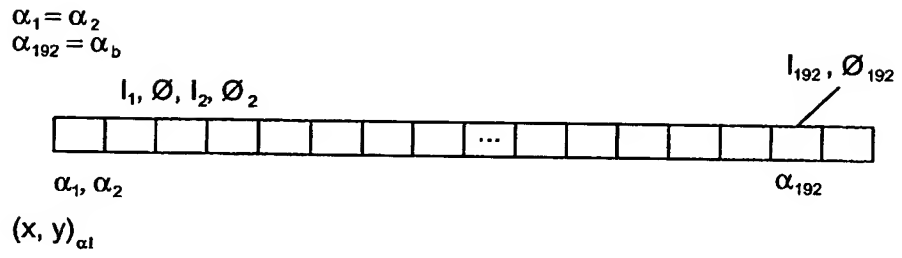


FIG. 17A

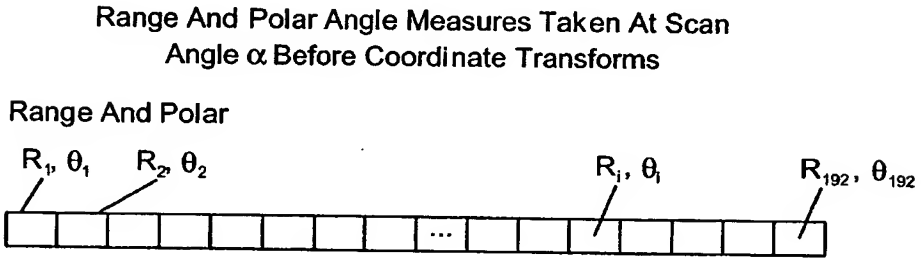


FIG. 17B

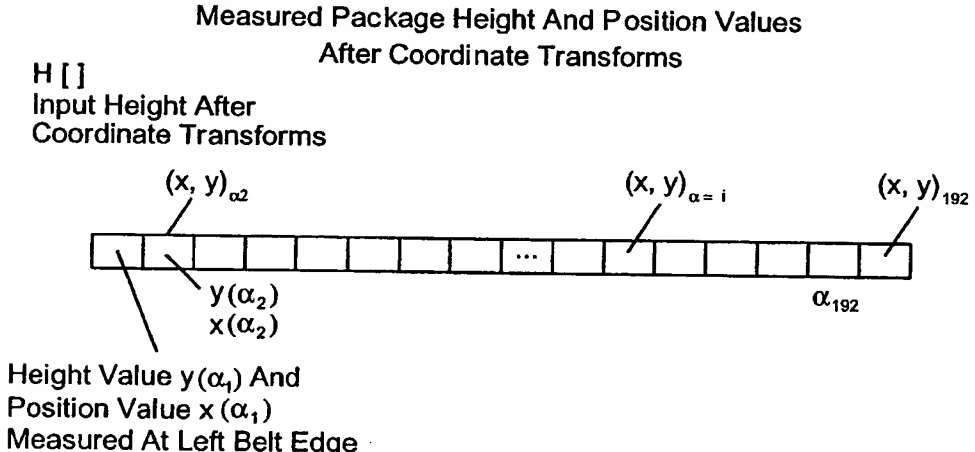


FIG. 17C

CAMERA CONTROL PROCESS CARRIED OUT WITHIN THE CAMERA CONTROL SUBSYSTEM OF EACH OBJECT IDENTIFICATION AND ATTRIBUTE ACQUISITION SYSTEM OF PRESENT INVENTION

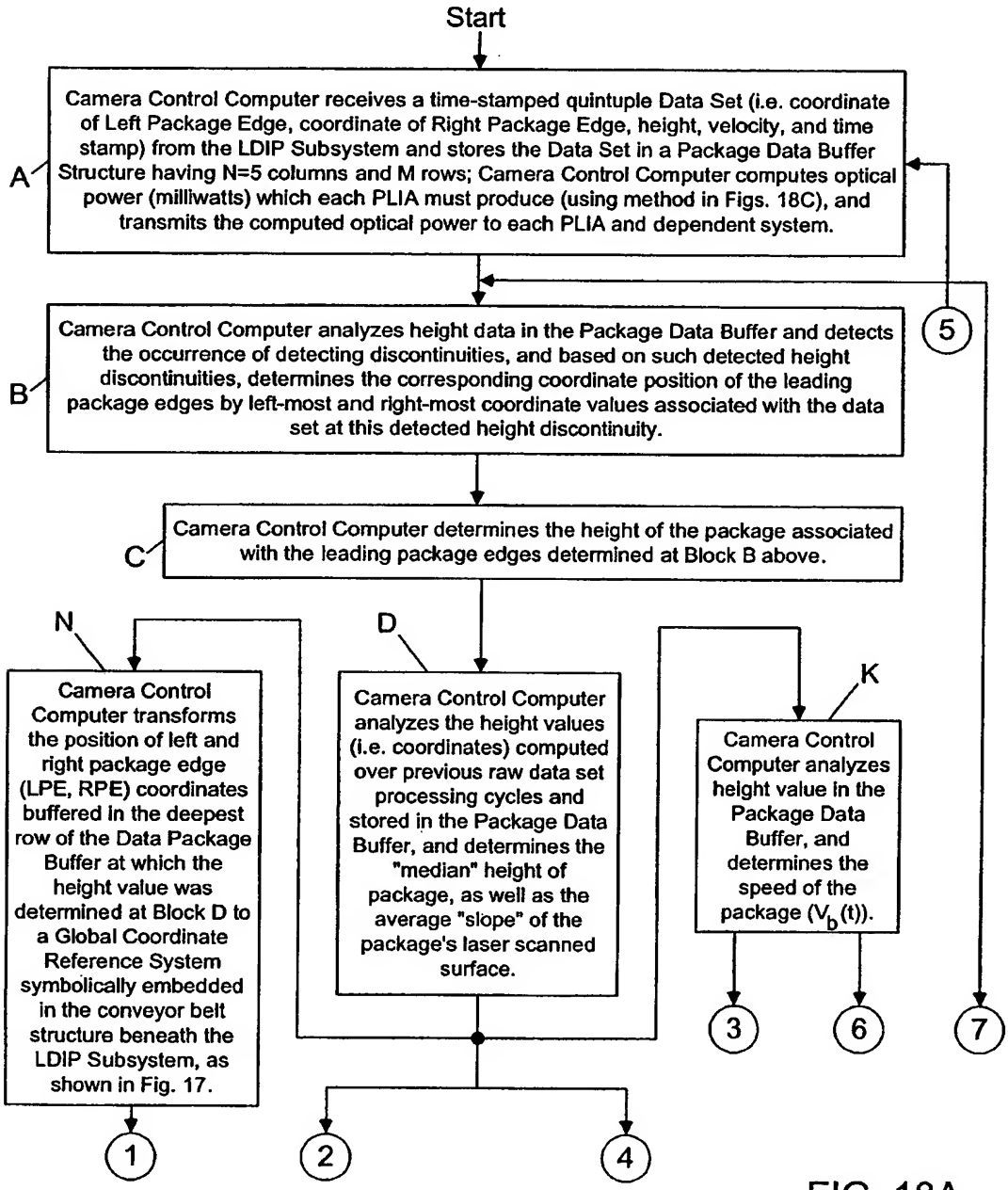


FIG. 18A

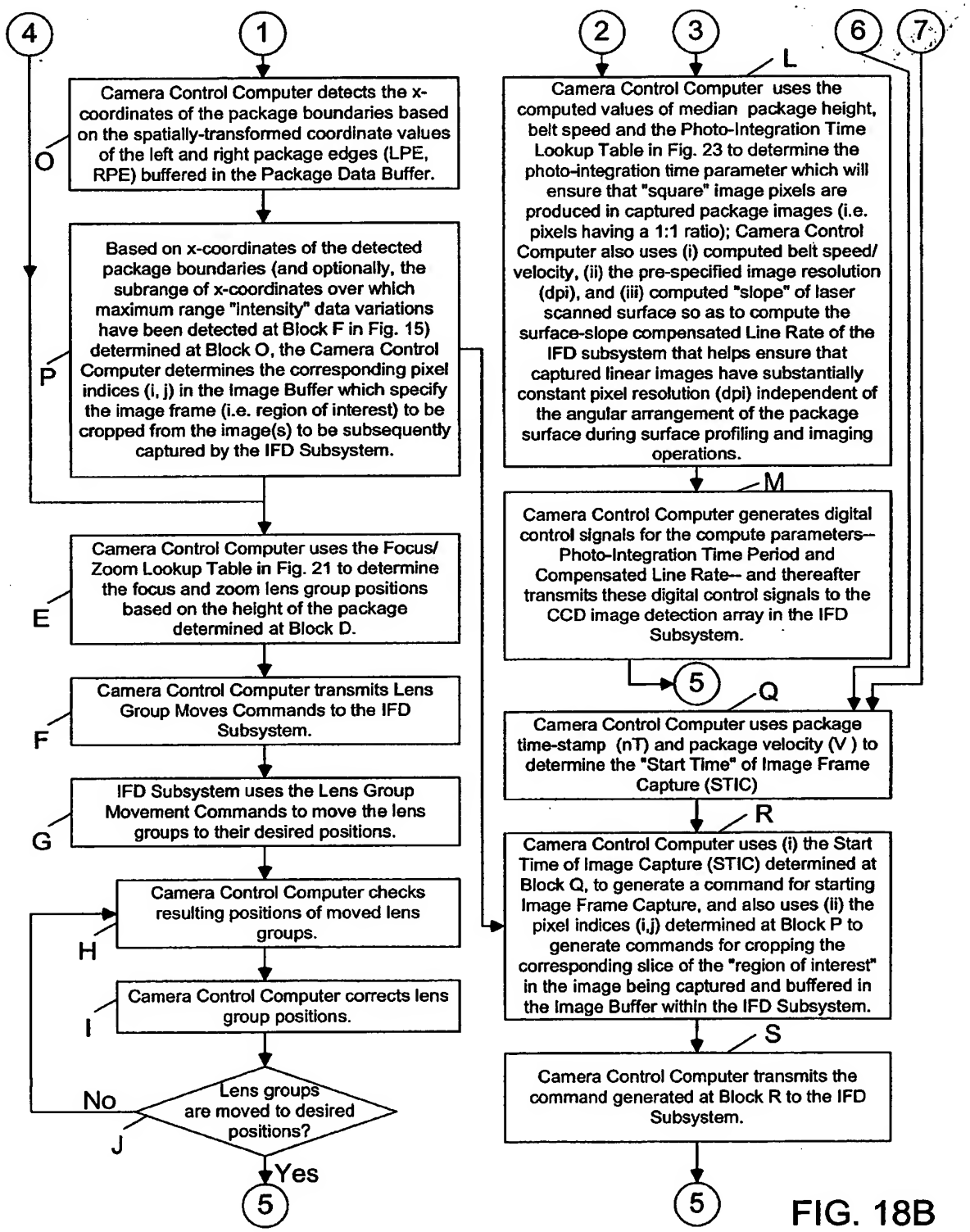

4
1
2
3
6
7
Camera Control Computer detects the x-coordinates of the package boundaries based on the spatially-transformed coordinate values of the left and right package edges (LPE, RPE) buffered in the Package Data Buffer.
O
Based on x-coordinates of the detected package boundaries (and optionally, the subrange of x-coordinates over which maximum range "intensity" data variations have been detected at Block F in Fig. 15) determined at Block O, the Camera Control Computer determines the corresponding pixel indices (i, j) in the Image Buffer which specify the image frame (i.e. region of interest) to be cropped from the image(s) to be subsequently captured by the IFD Subsystem.
P
Camera Control Computer uses the Focus/ Zoom Lookup Table in Fig. 21 to determine the focus and zoom lens group positions based on the height of the package determined at Block D.
E
Camera Control Computer transmits Lens Group Moves Commands to the IFD Subsystem.
F
IFD Subsystem uses the Lens Group Movement Commands to move the lens groups to their desired positions.
G
Camera Control Computer checks resulting positions of moved lens groups.
H
Camera Control Computer corrects lens group positions.
I
Lens groups are moved to desired positions?
No
J
Yes
5
Camera Control Computer uses the computed values of median package height, belt speed and the Photo-Integration Time Lookup Table in Fig. 23 to determine the photo-integration time parameter which will ensure that "square" image pixels are produced in captured package images (i.e. pixels having a 1:1 ratio); Camera Control Computer also uses (i) computed belt speed/ velocity, (ii) the pre-specified image resolution (dpi), and (iii) computed "slope" of laser scanned surface so as to compute the surface-slope compensated Line Rate of the IFD subsystem that helps ensure that captured linear images have substantially constant pixel resolution (dpi) independent of the angular arrangement of the package surface during surface profiling and imaging operations.
L
Camera Control Computer generates digital control signals for the compute parameters-- Photo-Integration Time Period and Compensated Line Rate-- and thereafter transmits these digital control signals to the CCD image detection array in the IFD Subsystem.
M
5
Camera Control Computer uses package time-stamp (nT) and package velocity (V) to determine the "Start Time" of Image Frame Capture (STIC)
Q
Camera Control Computer uses (i) the Start Time of Image Capture (STIC) determined at Block Q, to generate a command for starting Image Frame Capture, and also uses (ii) the pixel indices (i,j) determined at Block P to generate commands for cropping the corresponding slice of the "region of interest" in the image being captured and buffered in the Image Buffer within the IFD Subsystem.
R
Camera Control Computer transmits the command generated at Block R to the IFD Subsystem.
S
5

FIG. 18B

METHOD OF COMPUTING OPTICAL OUTPUT POWER FROM LASER DIODES IN A PLANAR LASER ILUMINATION ARRAY (PLIA) FOR CONTROLLING THE CONSTANT WHITE-LEVEL IN IMAGE PIXELS CAPTURED BY A PLIIM-BASED LINEAR IMAGER

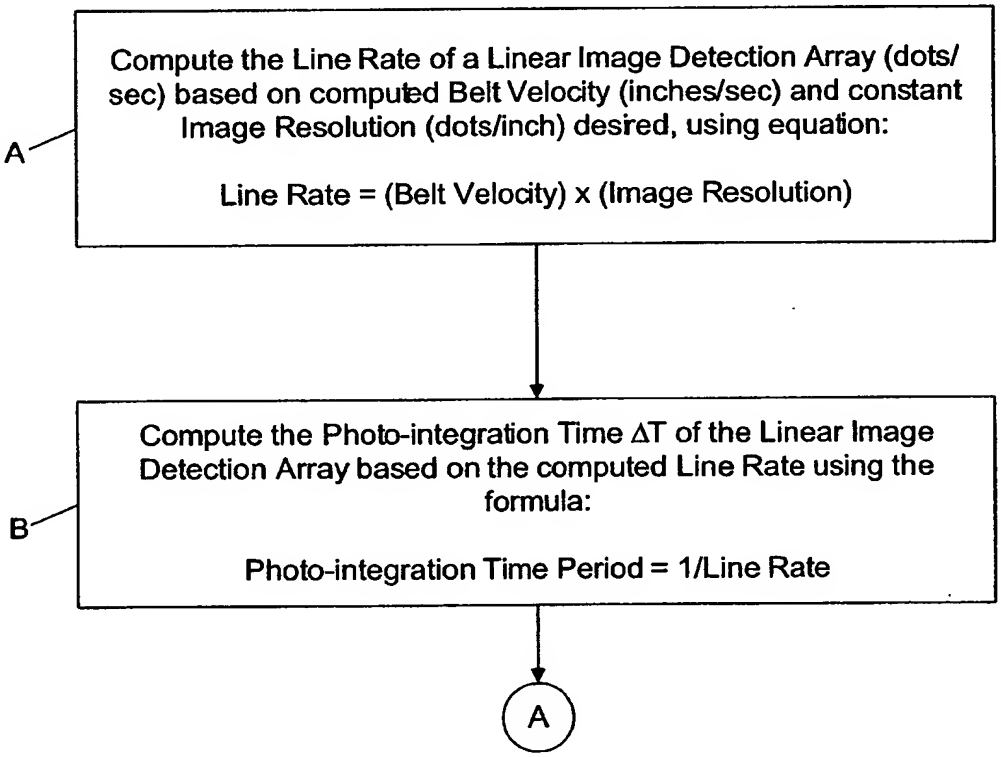


FIG. 18C1

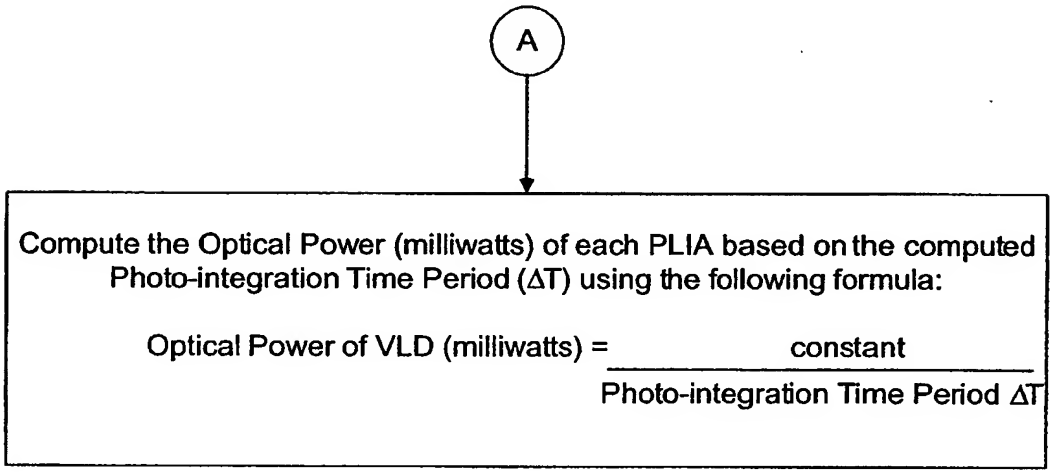

A
Compute the Optical Power (milliwatts) of each PLIA based on the computed Photo-integration Time Period (ΔT) using the following formula:
Optical Power of VLD (milliwatts) = constant / Photo-integration Time Period ΔT

FIG. 18C2

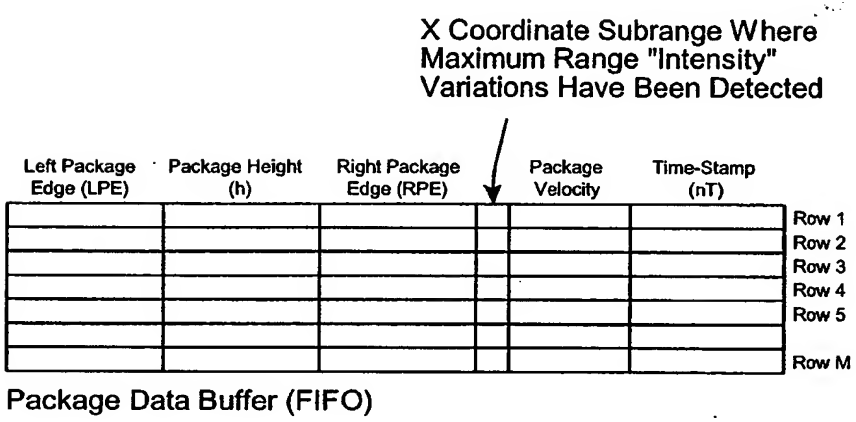

X Coordinate Subrange Where
Maximum Range "Intensity"
Variations Have Been Detected
Left Package Edge (LPE)
Package Height (h)
Right Package Edge (RPE)
Package Velocity
Time-Stamp (nT)
Row 1
Row 2
Row 3
Row 4
Row 5
Row M
Package Data Buffer (FIFO)

FIG. 19

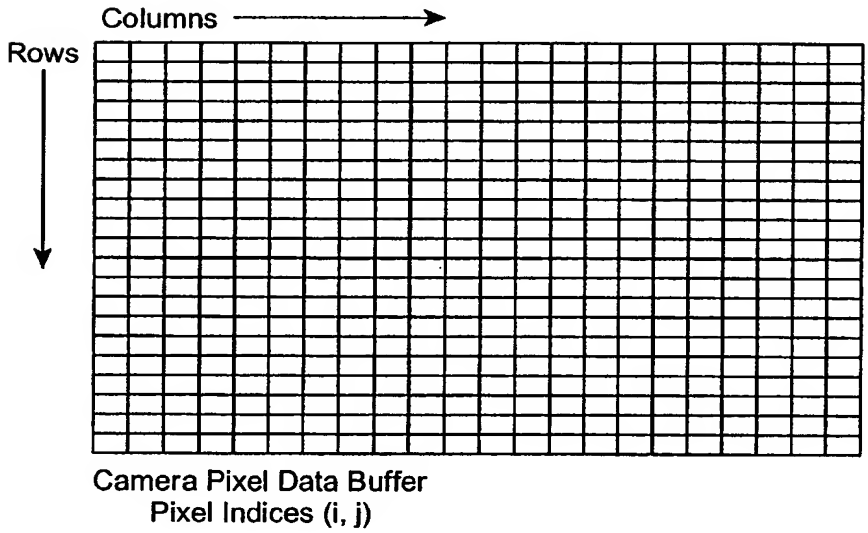

Columns
Rows
Camera Pixel Data Buffer
Pixel Indices (i, j)

FIG. 20

Zoom And Focus Lens Group Position Look-Up Table

Distance From Camera H (mm)		Zoom Group Distance (mm) Y (Zoom)	Focus Group Distance (mm) Y (Focus)
(Use Interpolation Techniques For Working Distances Between Listed Points In Table)	1000	21.57489228	2.47E-05
	1100	19.38089696	10.99009783
	1200	17.10673434	20.65783177
	1300	14.77137314	29.10917002
	1400	12.39153565	36.47312595
	1500	9.979114358	42.87845436
	1600	7.540639114	48.44003358
	1700	5.078794775	53.25495831
	1800	2.595989366	57.40834303
	1900	0.099972739	60.98883615

FIG. 21

* Note: The focal distance and zoom (eff. focal length) of camera lens are coupled (inter-dependant) in this commercial embodiment.

Camera Has A Fixed Aperture F56

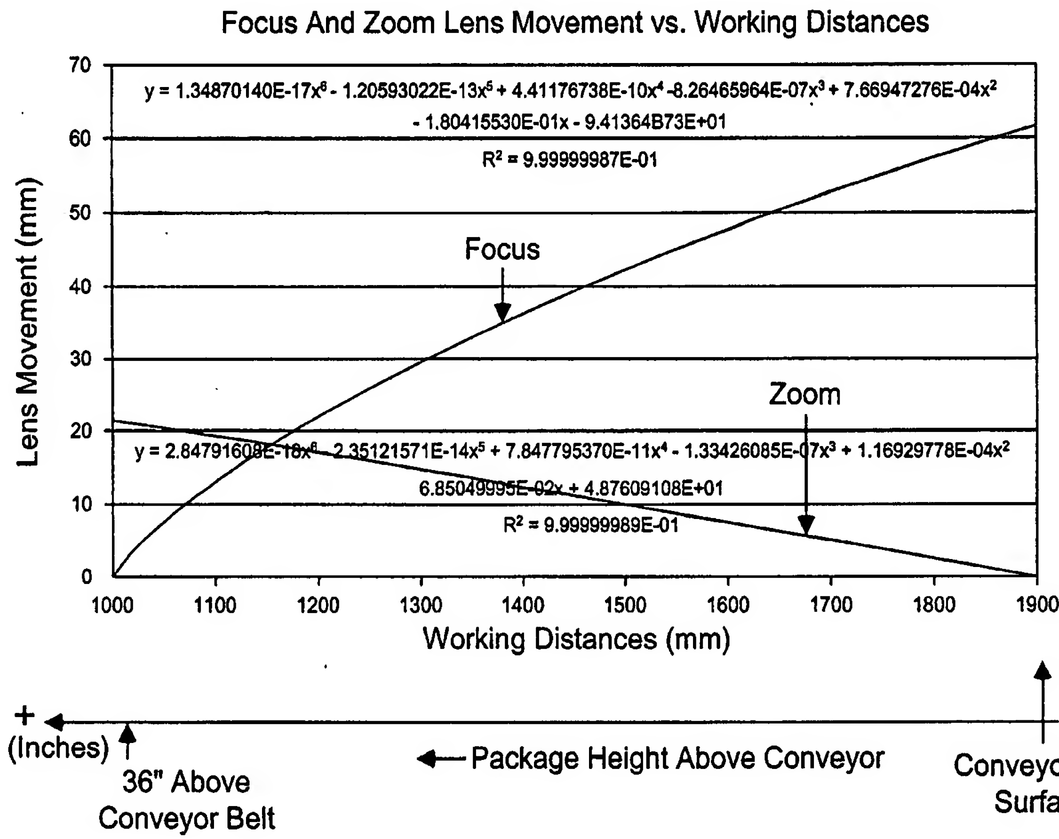


FIG. 22

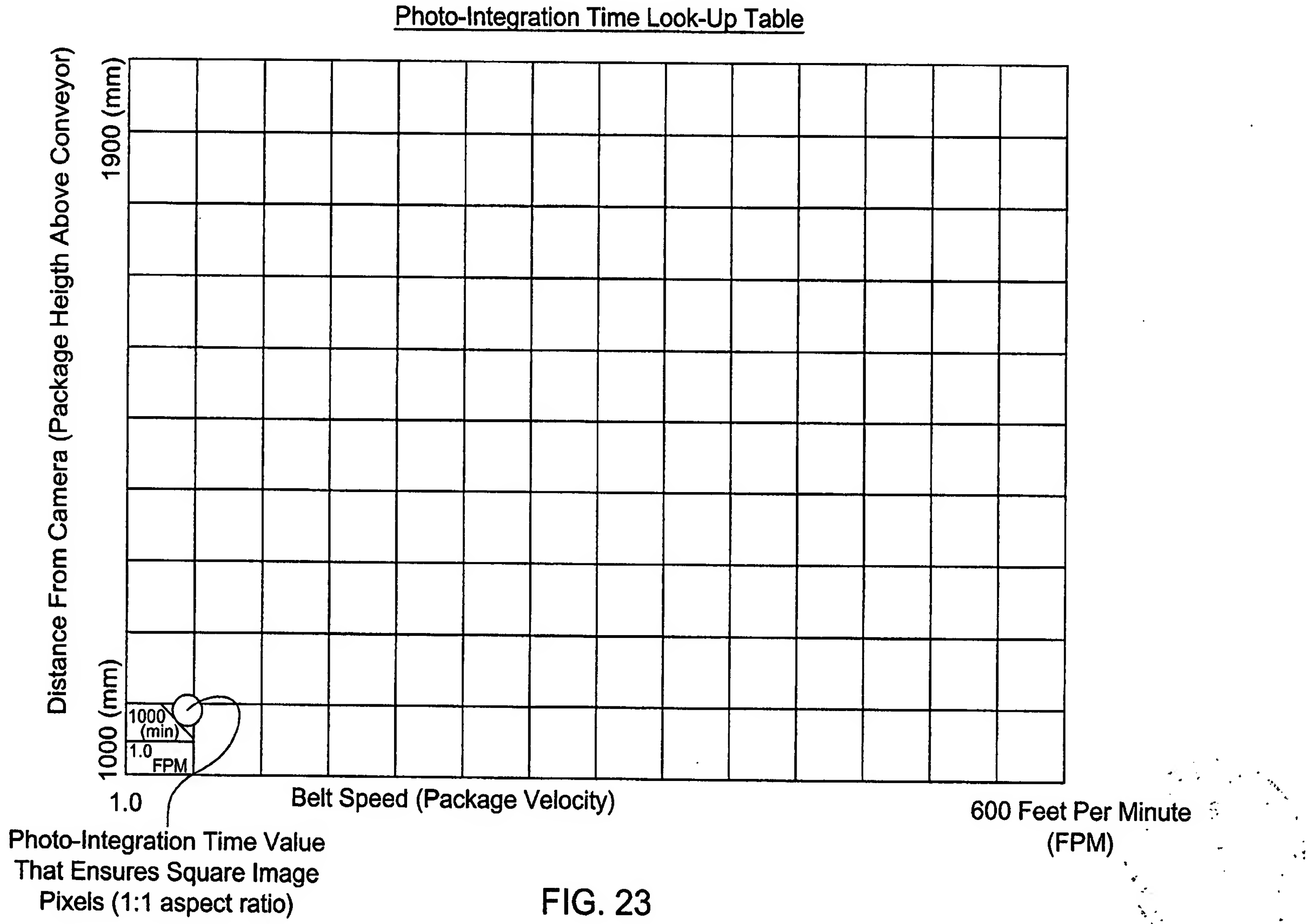


Photo-Integration Time Look-Up Table
Distance From Camera (Package Heigth Above Conveyor)
1900 (mm)
1000 (mm)
1000 (min)
1.0 FPM
1.0
Belt Speed (Package Velocity)
600 Feet Per Minute (FPM)
Photo-Integration Time Value That Ensures Square Image Pixels (1:1 aspect ratio)

FIG. 23

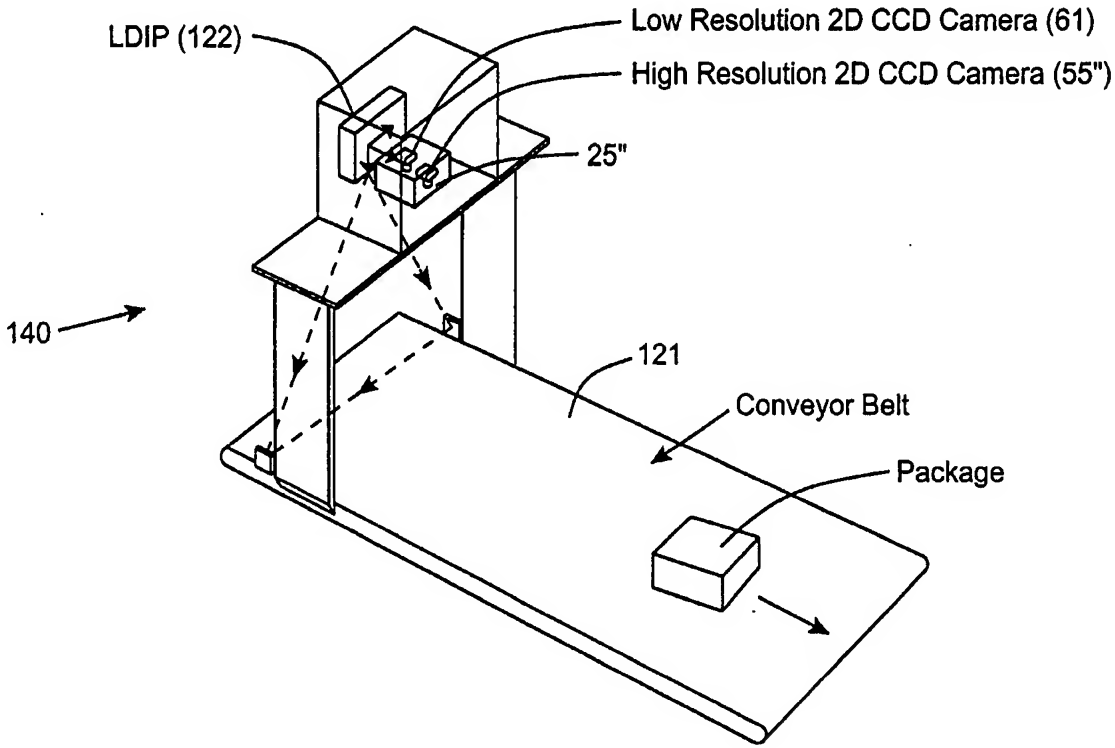


FIG. 24

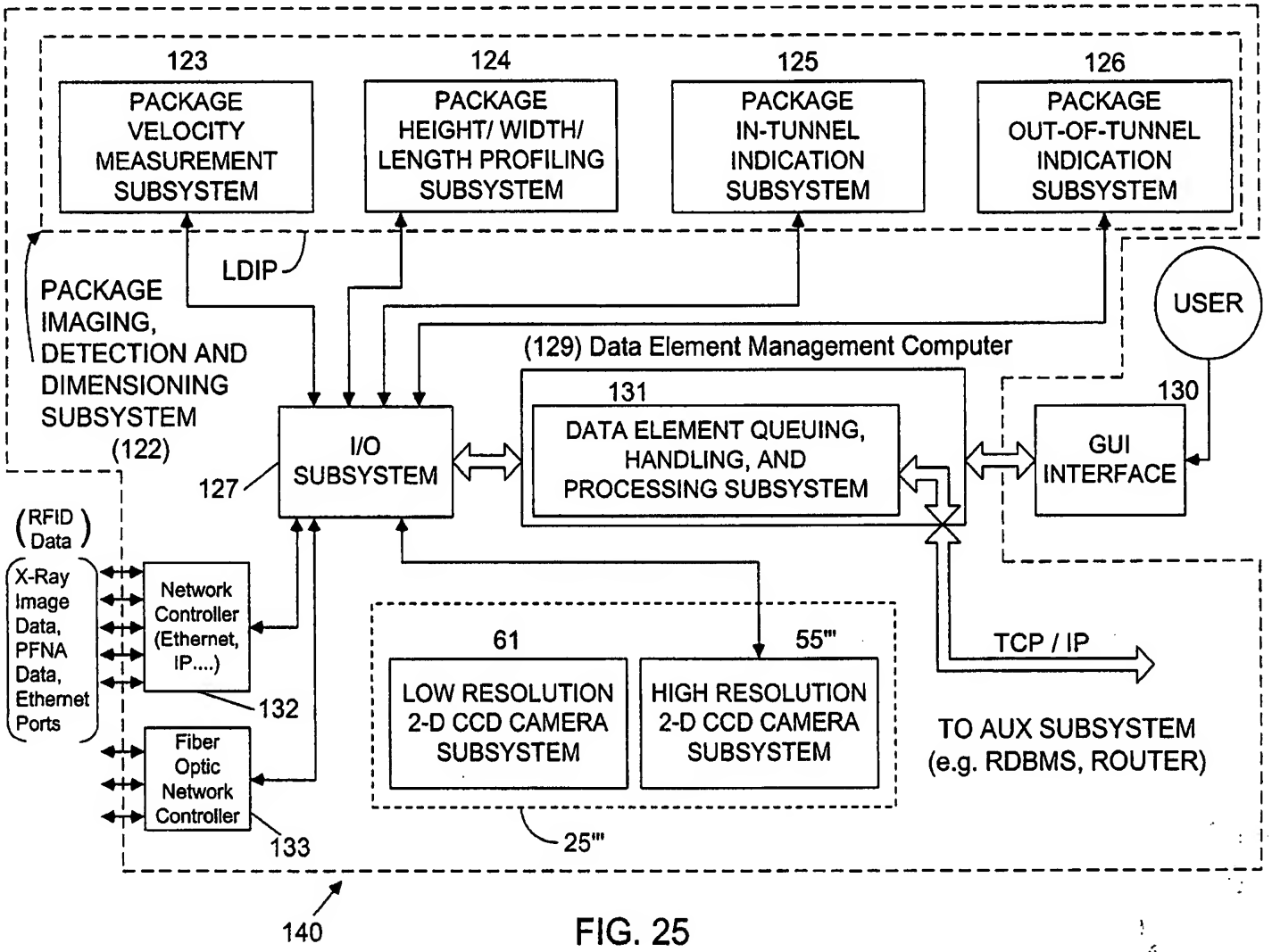

123
PACKAGE VELOCITY MEASUREMENT SUBSYSTEM
124
PACKAGE HEIGHT/ WIDTH/ LENGTH PROFILING SUBSYSTEM
125
PACKAGE IN-TUNNEL INDICATION SUBSYSTEM
126
PACKAGE OUT-OF-TUNNEL INDICATION SUBSYSTEM
LDIP
PACKAGE IMAGING, DETECTION AND DIMENSIONING SUBSYSTEM (122)
USER
(129) Data Element Management Computer
131
130
I/O SUBSYSTEM
127
DATA ELEMENT QUEUING, HANDLING, AND PROCESSING SUBSYSTEM
GUI INTERFACE
(RFID Data)
X-Ray Image Data, PFNA Data, Ethernet Ports
Network Controller (Ethernet, IP....)
132
Fiber Optic Network Controller
133
61
55'''
LOW RESOLUTION 2-D CCD CAMERA SUBSYSTEM
HIGH RESOLUTION 2-D CCD CAMERA SUBSYSTEM
25'''
TCP / IP
TO AUX SUBSYSTEM (e.g. RDBMS, ROUTER)
140

FIG. 25

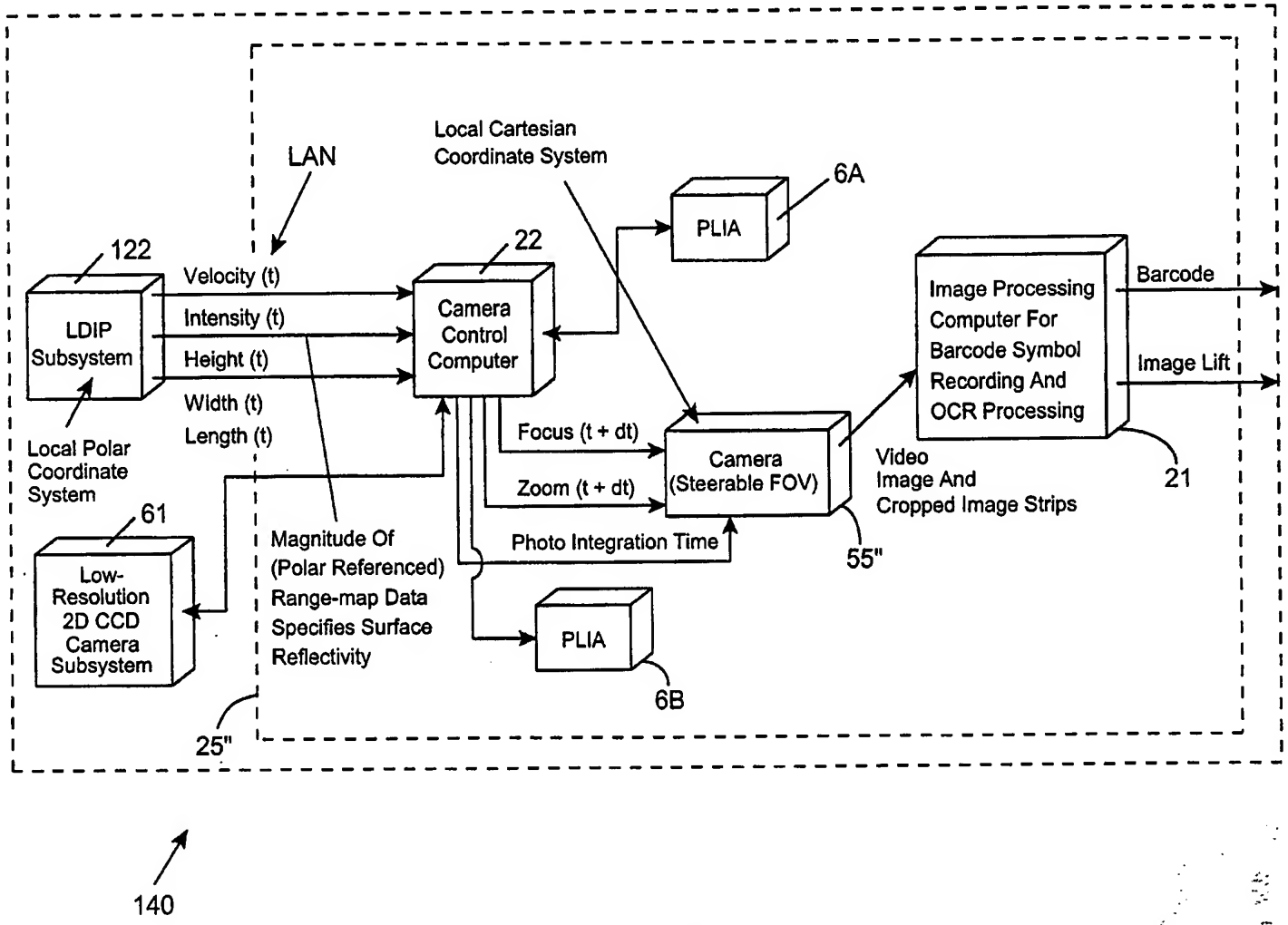

LAN
Local Cartesian
Coordinate System
6A
PLIA
122
22
LDIP
Subsystem
Velocity (t)
Intensity (t)
Height (t)
Width (t)
Length (t)
Camera
Control
Computer
Image Processing
Computer For
Barcode Symbol
Recording And
OCR Processing
Barcode
Image Lift
21
Local Polar
Coordinate
System
Focus (t + dt)
Zoom (t + dt)
Photo Integration Time
Camera
(Steerable FOV)
Video
Image And
Cropped Image Strips
55"
61
Low-
Resolution
2D CCD
Camera
Subsystem
Magnitude Of
(Polar Referenced)
Range-map Data
Specifies Surface
Reflectivity
PLIA
6B
25"
140

FIG. 26

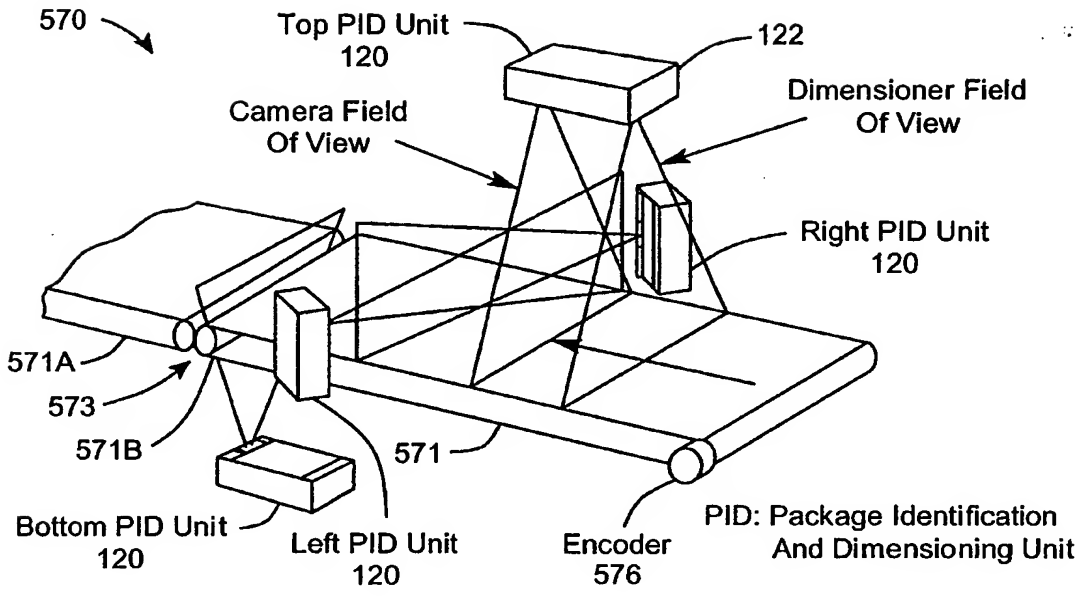

570
Top PID Unit
120
122
Dimensioner Field
Of View
Camera Field
Of View
Right PID Unit
120
571A
573
571B
571
Bottom PID Unit
120
Left PID Unit
120
Encoder
576
PID: Package Identification
And Dimensioning Unit

FIG. 27

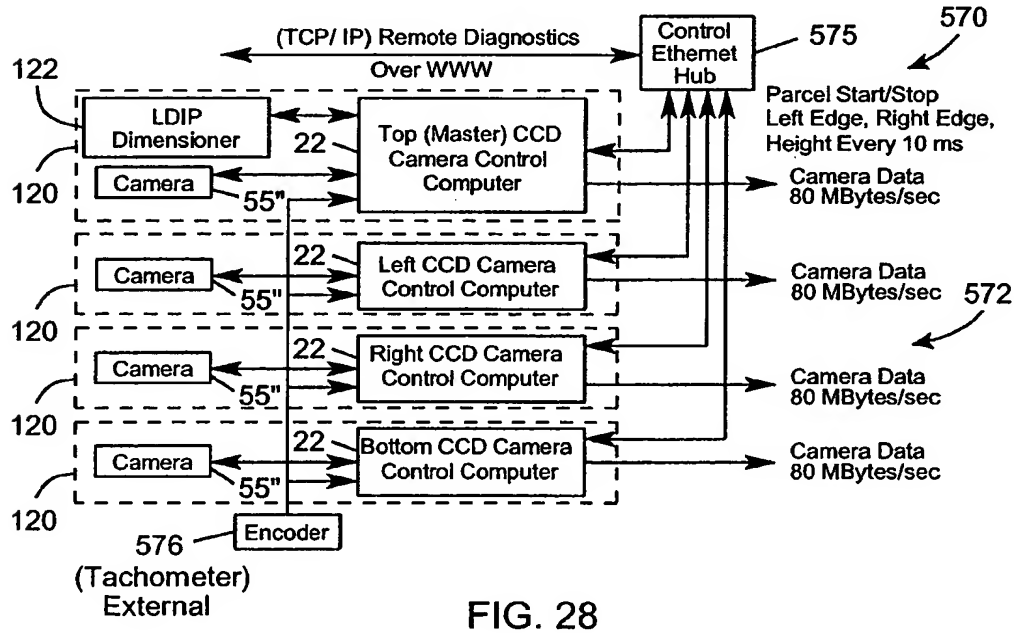

(TCP/ IP) Remote Diagnostics
Over WWW
Control
Ethernet
Hub
575
570
122
LDIP
Dimensioner
22
Top (Master) CCD
Camera Control
Computer
Parcel Start/Stop
Left Edge, Right Edge,
Height Every 10 ms
120
Camera
55"
Camera Data
80 MBytes/sec
Left CCD Camera
Control Computer
Right CCD Camera
Control Computer
Bottom CCD Camera
Control Computer
572
576
Encoder
(Tachometer)
External

FIG. 28

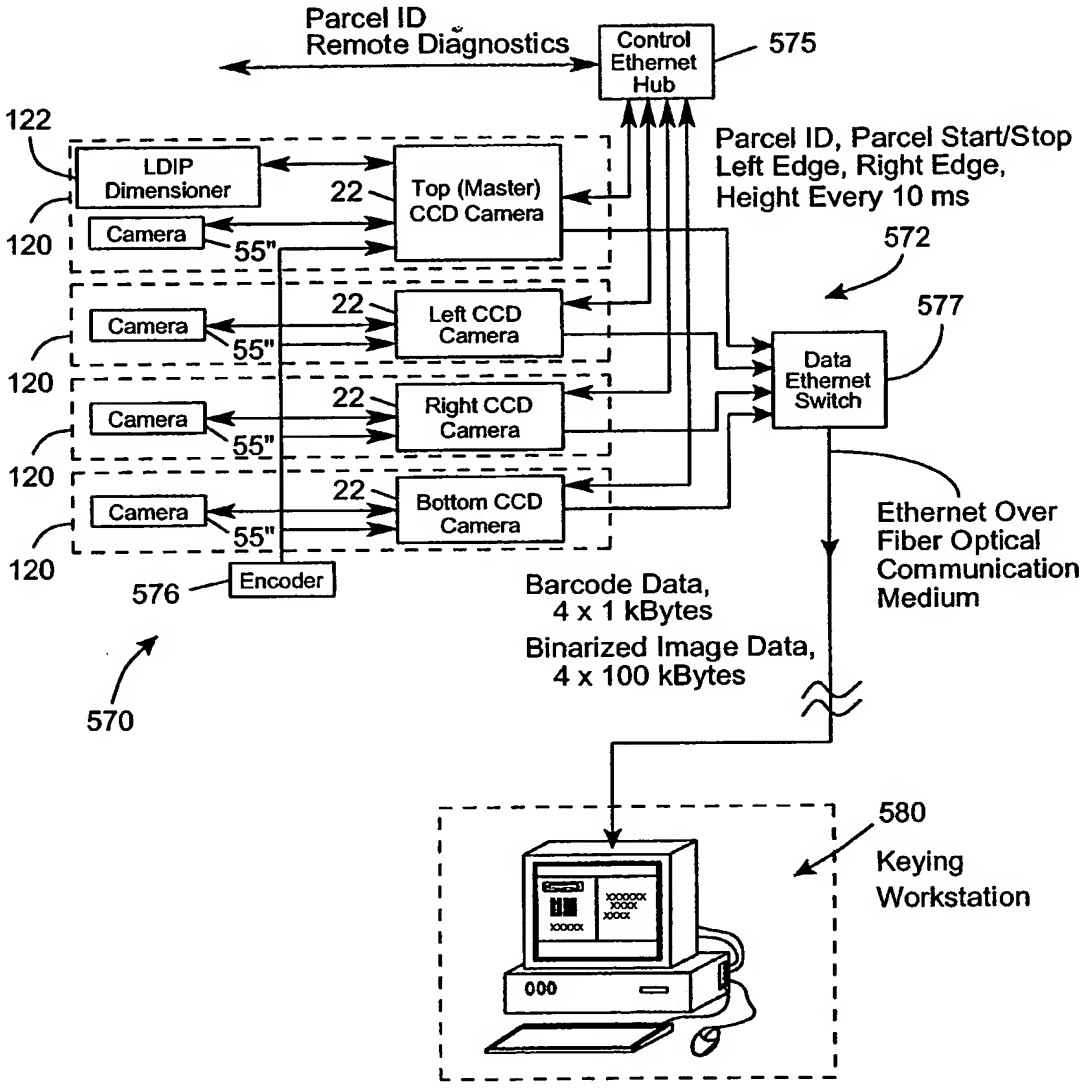

Parcel ID
Remote Diagnostics
Control Ethernet Hub
575
122
LDIP Dimensioner
120
Camera
55"
22
Top (Master) CCD Camera
Parcel ID, Parcel Start/Stop
Left Edge, Right Edge,
Height Every 10 ms
572
Left CCD Camera
Right CCD Camera
Bottom CCD Camera
577
Data Ethernet Switch
Ethernet Over Fiber Optical Communication Medium
576
Encoder
Barcode Data, 4 x 1 kBytes
Binarized Image Data, 4 x 100 kBytes
570
580
Keying Workstation

FIG. 29

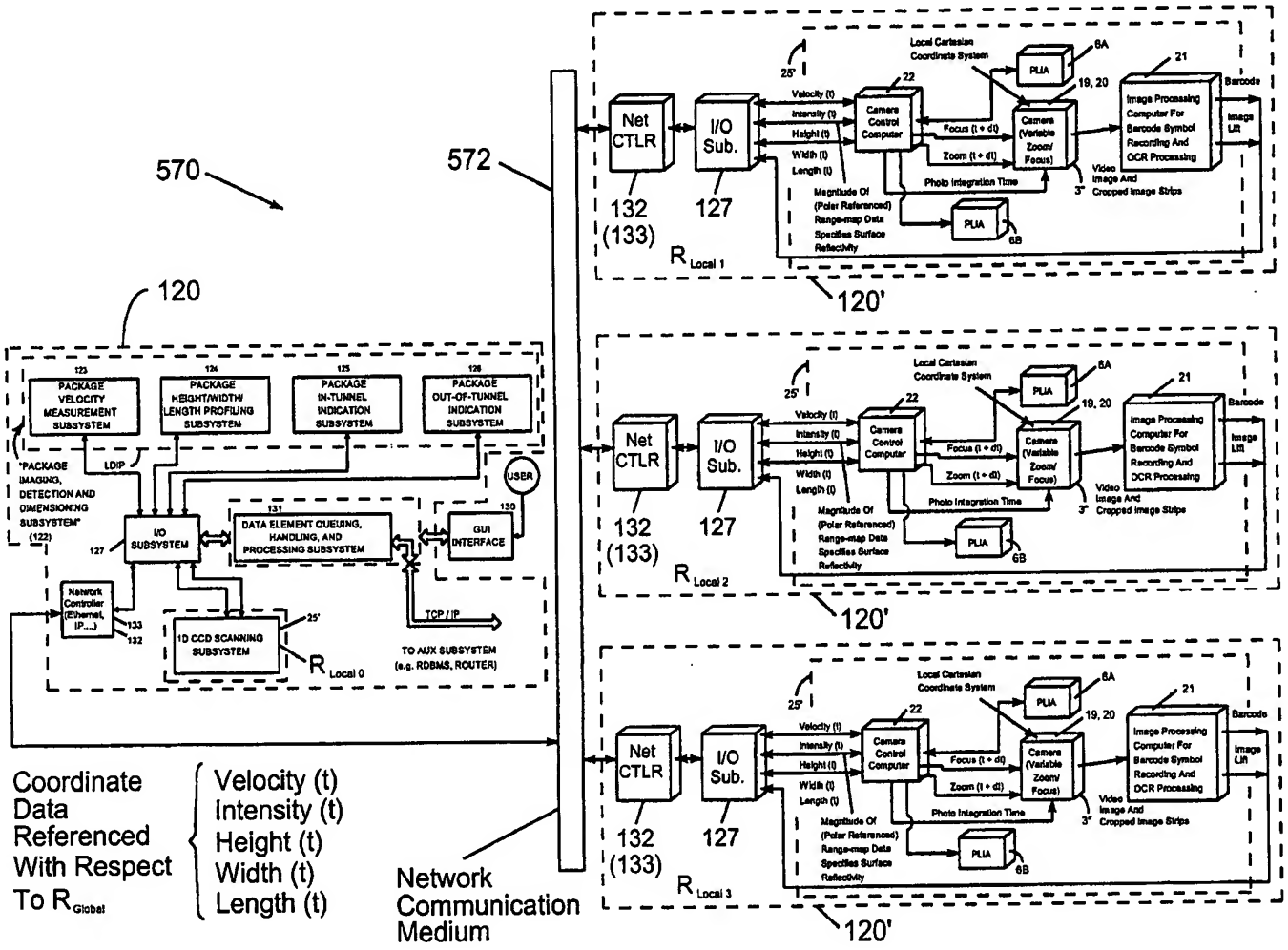
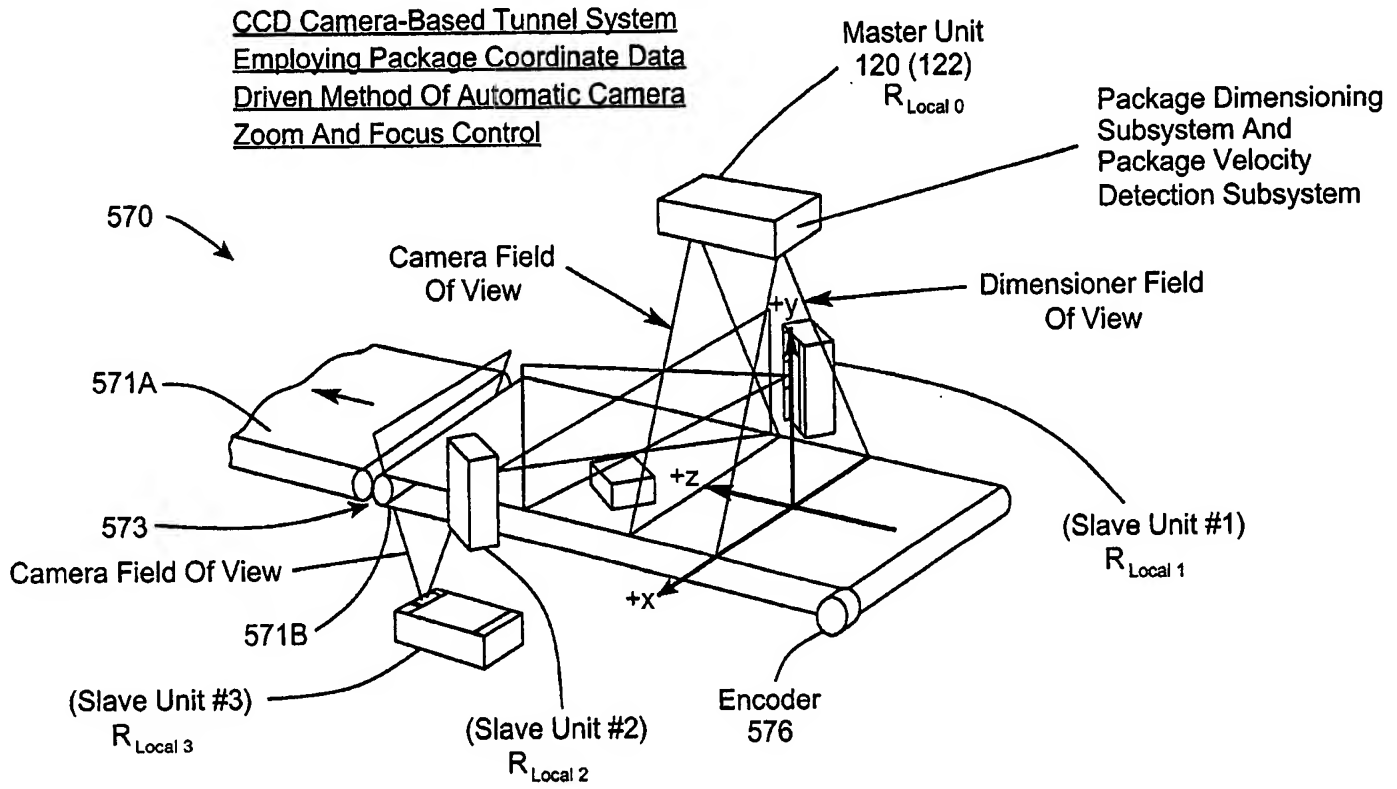

570
572
120
120'
Net CTLR
I/O Sub.
132 (133)
127
R Local 1
R Local 2
R Local 3
Local Cartesian Coordinate System
Camera Control Computer
Camera (Variable Zoom/ Focus)
PLIA
Image Processing Computer For Barcode Symbol Recording And OCR Processing
Barcode
Image Lift
Video Image And Cropped Image Strips
Photo Integration Time
Focus (t + dt)
Zoom (t + dt)
Velocity (t)
Intensity (t)
Height (t)
Width (t)
Length (t)
Magnitude Of (Polar Referenced) Range-map Data Specifies Surface Reflectivity
PACKAGE VELOCITY MEASUREMENT SUBSYSTEM
PACKAGE HEIGHT/WIDTH/ LENGTH PROFILING SUBSYSTEM
PACKAGE IN-TUNNEL INDICATION SUBSYSTEM
PACKAGE OUT-OF-TUNNEL INDICATION SUBSYSTEM
"PACKAGE IMAGING, DETECTION AND DIMENSIONING SUBSYSTEM" (122)
LDIP
USER
I/O SUBSYSTEM
DATA ELEMENT QUEUING, HANDLING, AND PROCESSING SUBSYSTEM
GUI INTERFACE
Network Controller (Ethernet, IP...)
1D CCD SCANNING SUBSYSTEM
R Local 0
TCP / IP
TO AUX SUBSYSTEM (e.g. RDBMS, ROUTER)
Coordinate Data Referenced With Respect To R Global
Velocity (t)
Intensity (t)
Height (t)
Width (t)
Length (t)
Network Communication Medium

FIG. 30



$$\text{Package Coordinate Data} \| R_{Global} \xrightarrow{HG} \text{Package Coordinate Data} \| R_{Local\ i}$$

FIG. 31

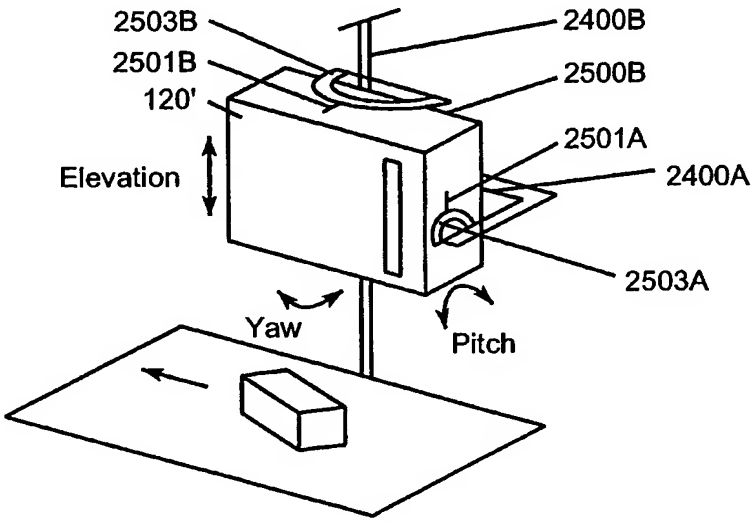


FIG. 31A

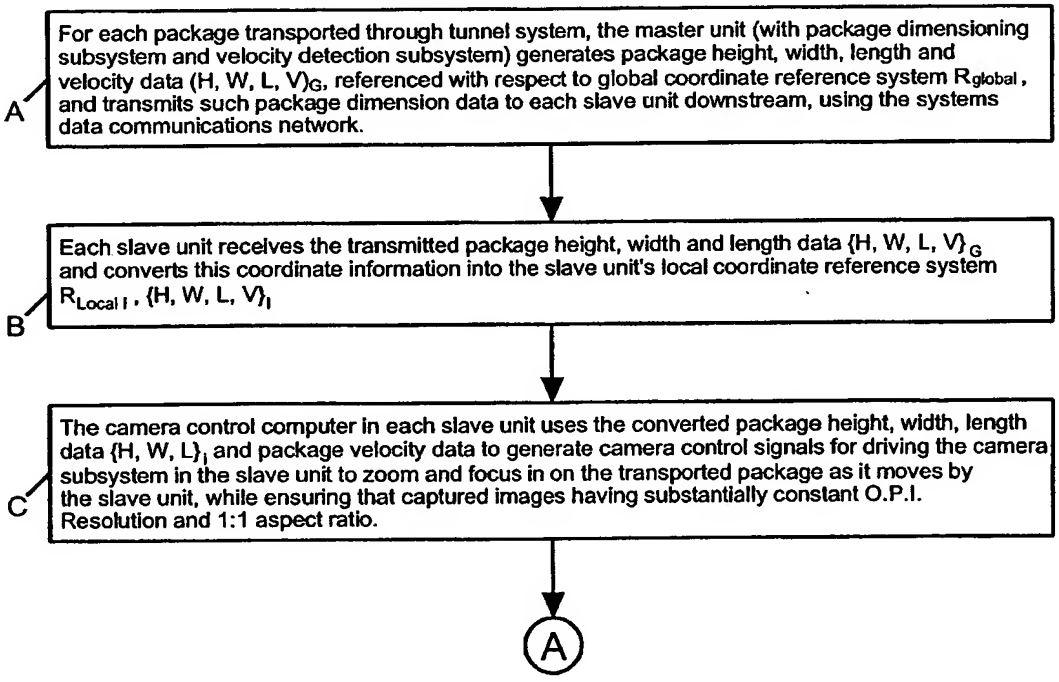


FIG. 32A

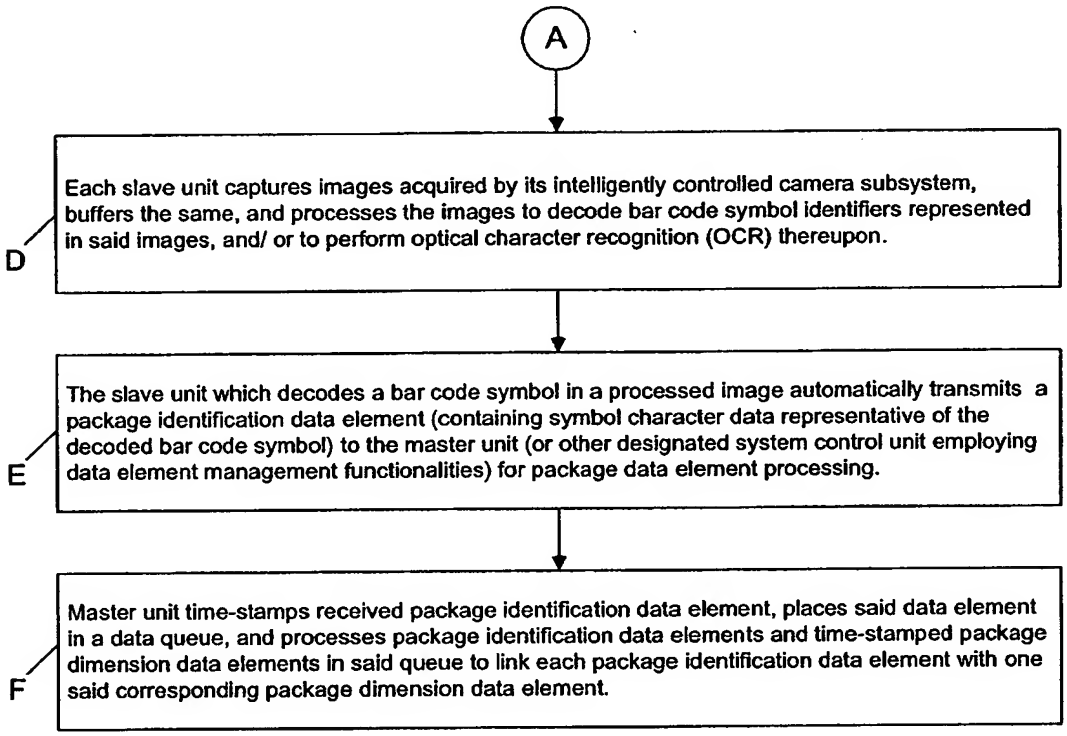

A
Each slave unit captures images acquired by its intelligently controlled camera subsystem, buffers the same, and processes the images to decode bar code symbol identifiers represented in said images, and/ or to perform optical character recognition (OCR) thereupon.
D
The slave unit which decodes a bar code symbol in a processed image automatically transmits a package identification data element (containing symbol character data representative of the decoded bar code symbol) to the master unit (or other designated system control unit employing data element management functionalities) for package data element processing.
E
Master unit time-stamps received package identification data element, places said data element in a data queue, and processes package identification data elements and time-stamped package dimension data elements in said queue to link each package identification data element with one said corresponding package dimension data element.
F

FIG. 32B

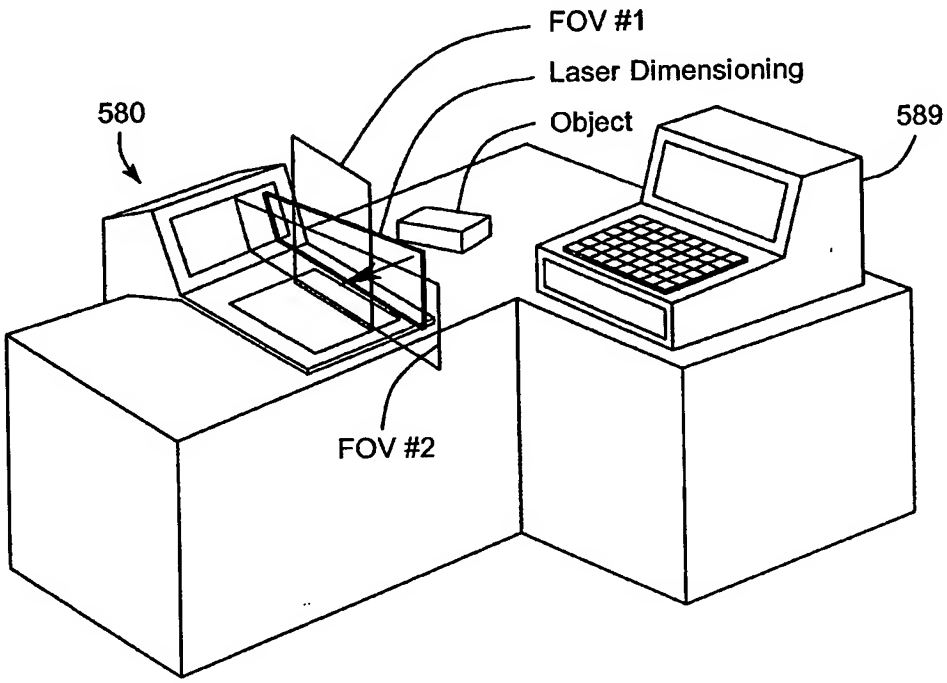


FIG. 33A

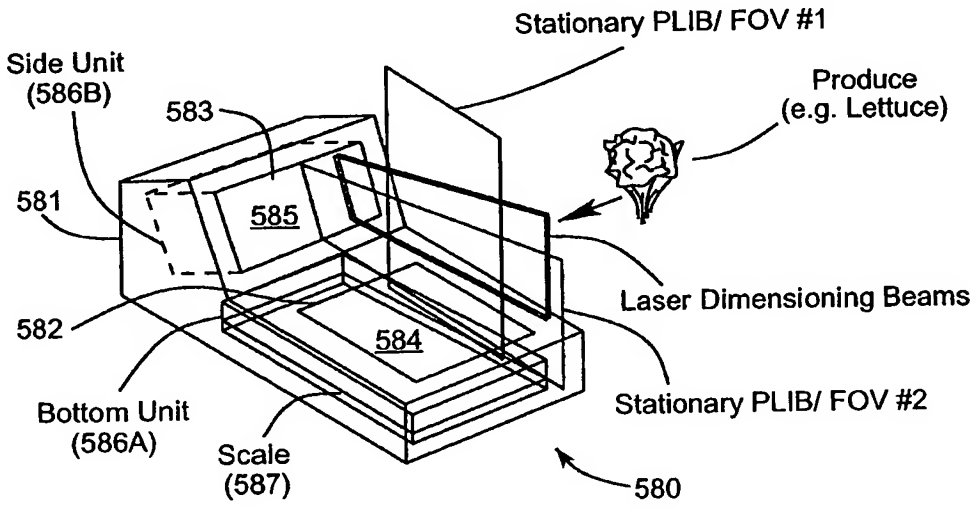


FIG. 33B

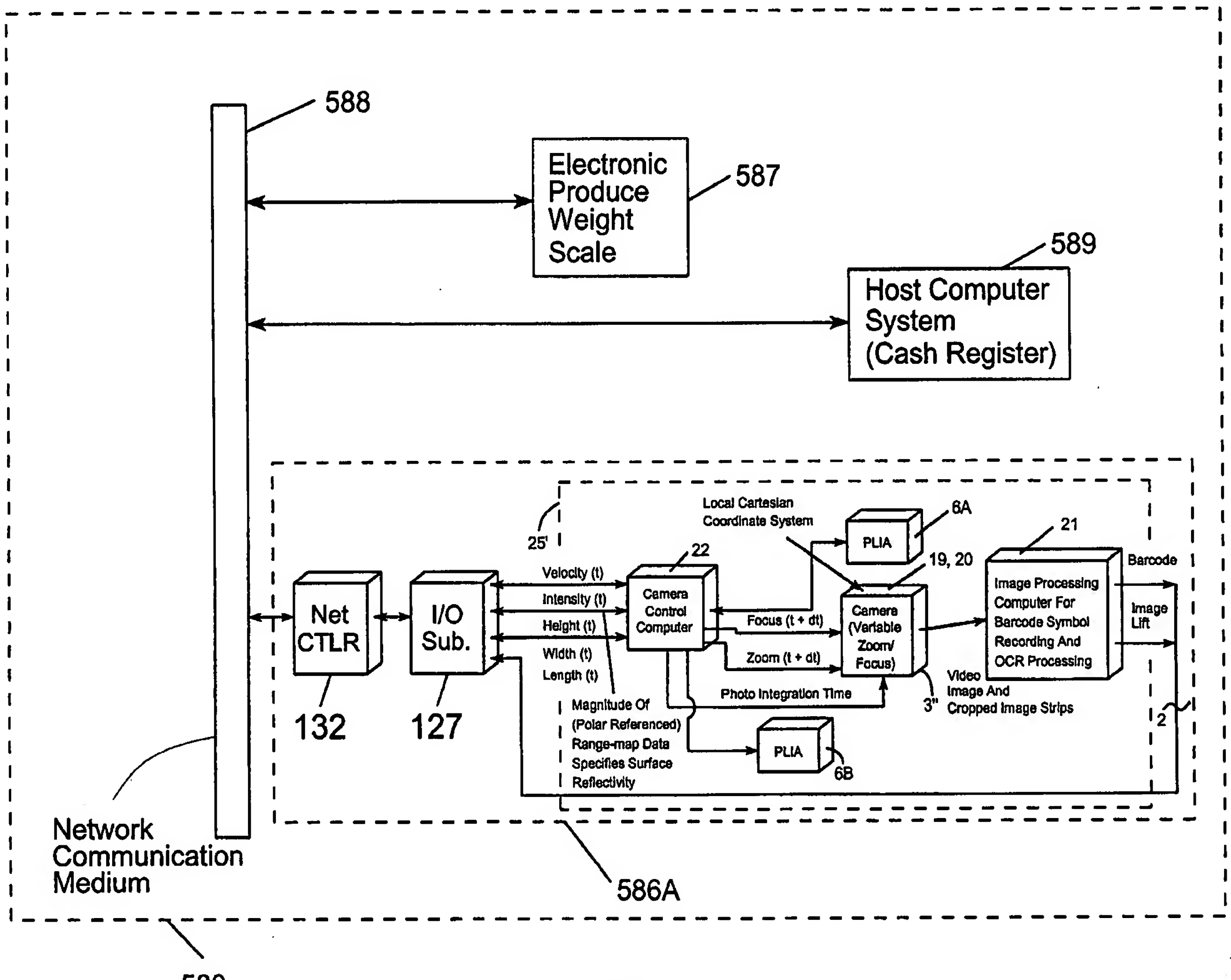

588
Electronic Produce Weight Scale
587
589
Host Computer System (Cash Register)
Net CTLR
132
I/O Sub.
127
Velocity (t)
Intensity (t)
Height (t)
Width (t)
Length (t)
Magnitude Of (Polar Referenced) Range-map Data Specifies Surface Reflectivity
25'
22
Camera Control Computer
Local Cartesian Coordinate System
PLIA
6A
19, 20
Focus (t + dt)
Zoom (t + dt)
Camera (Variable Zoom/ Focus)
Photo Integration Time
PLIA
6B
3"
Video Image And Cropped Image Strips
21
Image Processing Computer For Barcode Symbol Recording And OCR Processing
Barcode
Image Lift
2
Network Communication Medium
586A
580

FIG. 33C1

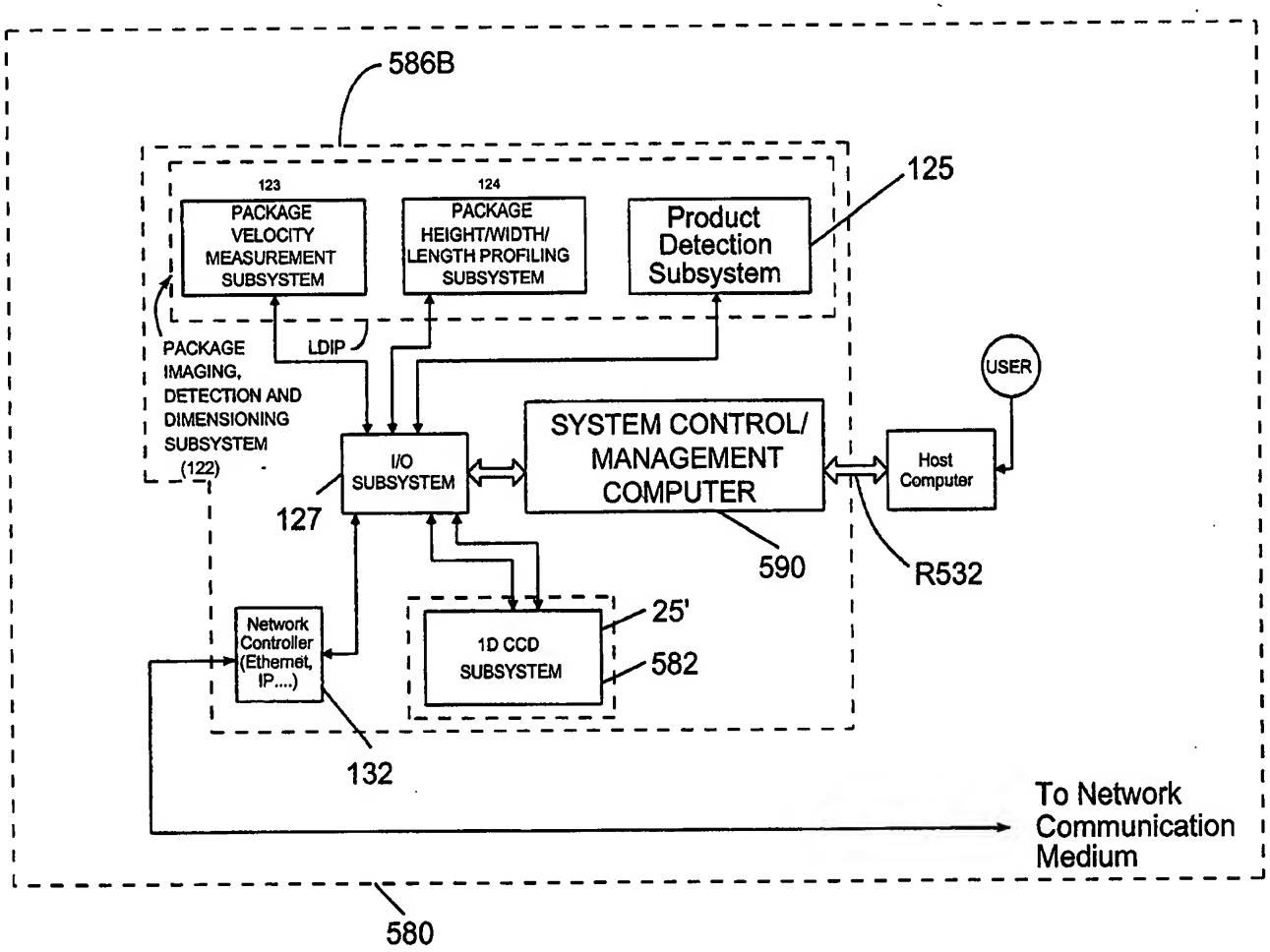

586B
123
PACKAGE VELOCITY MEASUREMENT SUBSYSTEM
124
PACKAGE HEIGHT/WIDTH/ LENGTH PROFILING SUBSYSTEM
Product Detection Subsystem
125
PACKAGE IMAGING, DETECTION AND DIMENSIONING SUBSYSTEM (122)
LDIP
USER
I/O SUBSYSTEM
127
SYSTEM CONTROL/ MANAGEMENT COMPUTER
590
Host Computer
R532
Network Controller (Ethernet, IP....)
1D CCD SUBSYSTEM
25'
582
132
To Network Communication Medium
580

FIG. 33C2

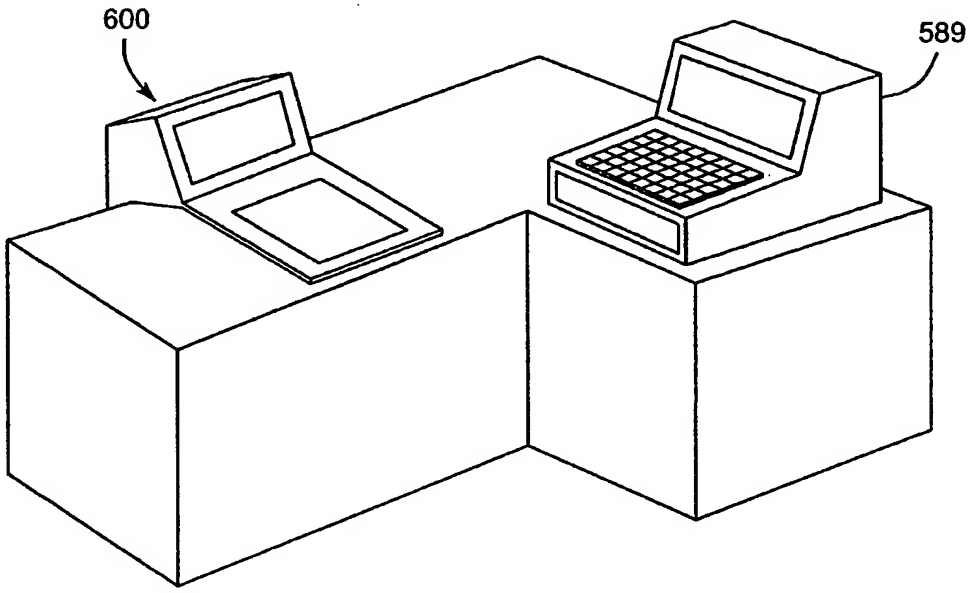


FIG. 34A

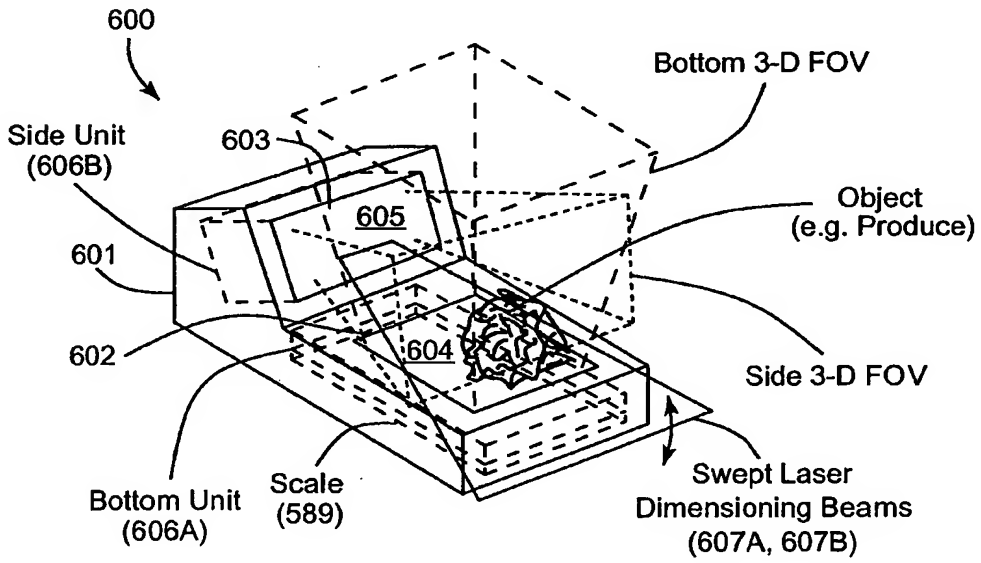


FIG. 34B

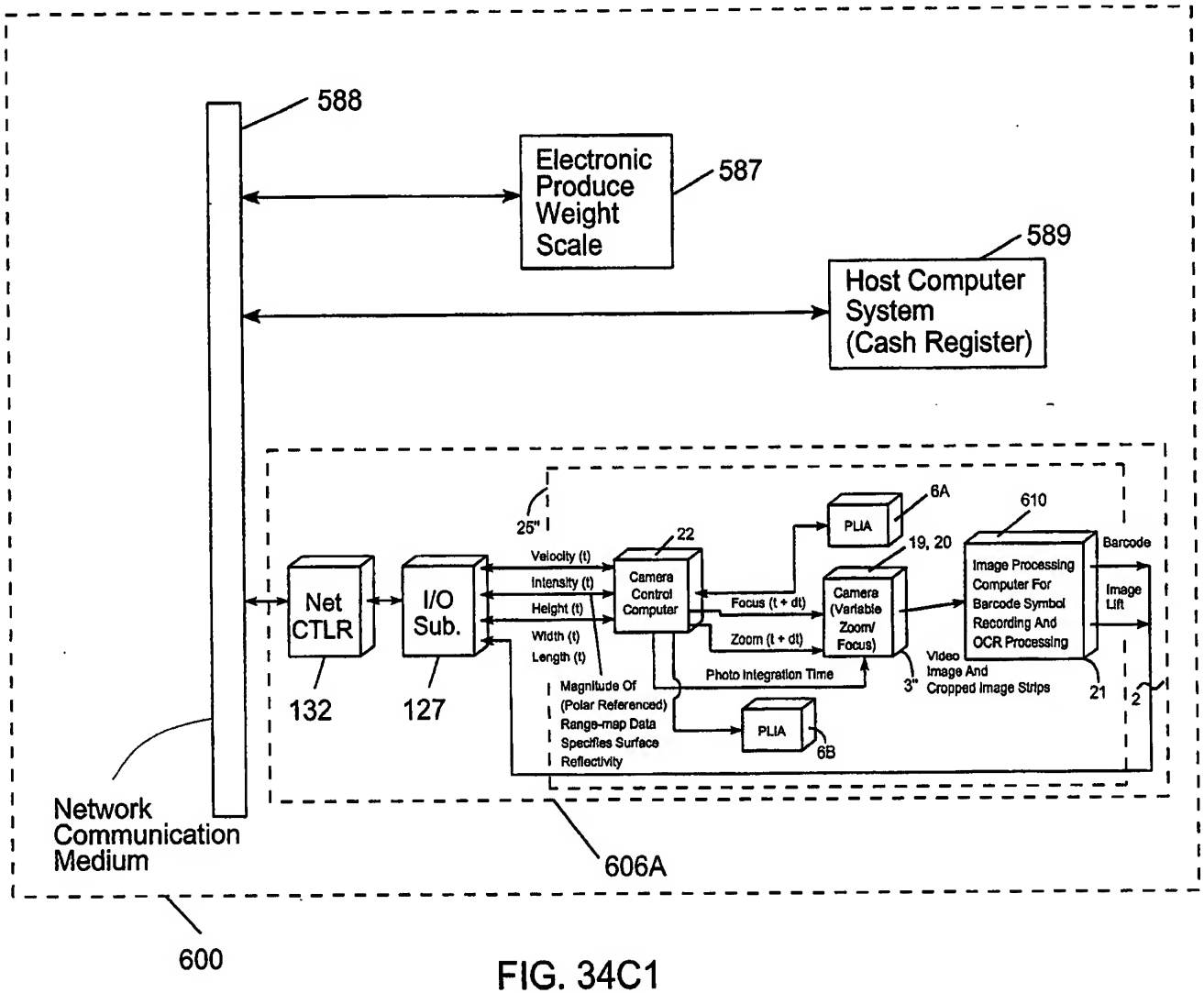

588
Electronic Produce Weight Scale
587
589
Host Computer System (Cash Register)
25"
22
6A
PLIA
610
19, 20
Barcode
Image Lift
Net CTLR
I/O Sub.
Velocity (t)
Intensity (t)
Height (t)
Width (t)
Length (t)
Camera Control Computer
Focus (t + dt)
Zoom (t + dt)
Camera (Variable Zoom/ Focus)
Image Processing Computer For Barcode Symbol Recording And OCR Processing
Photo Integration Time
Video Image And Cropped Image Strips
3"
21
2
132
127
Magnitude Of (Polar Referenced) Range-map Data Specifies Surface Reflectivity
PLIA
6B
Network Communication Medium
606A
600

FIG. 34C1

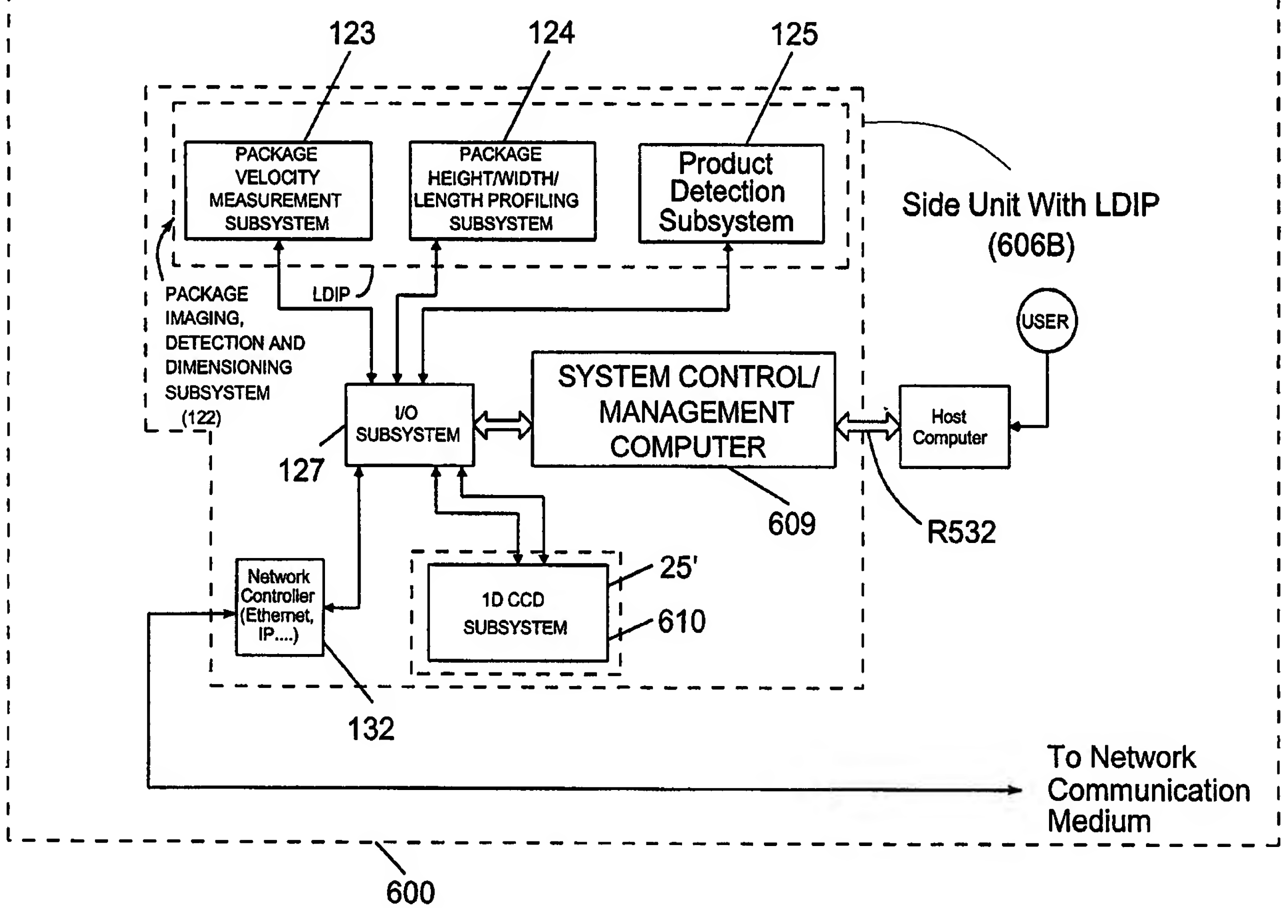

123
124
125
PACKAGE VELOCITY MEASUREMENT SUBSYSTEM
PACKAGE HEIGHT/WIDTH/ LENGTH PROFILING SUBSYSTEM
Product Detection Subsystem
Side Unit With LDIP (606B)
LDIP
PACKAGE IMAGING, DETECTION AND DIMENSIONING SUBSYSTEM (122)
USER
I/O SUBSYSTEM
SYSTEM CONTROL/ MANAGEMENT COMPUTER
Host Computer
127
609
R532
Network Controller (Ethernet, IP....)
1D CCD SUBSYSTEM
25'
610
132
To Network Communication Medium
600

FIG. 34C2

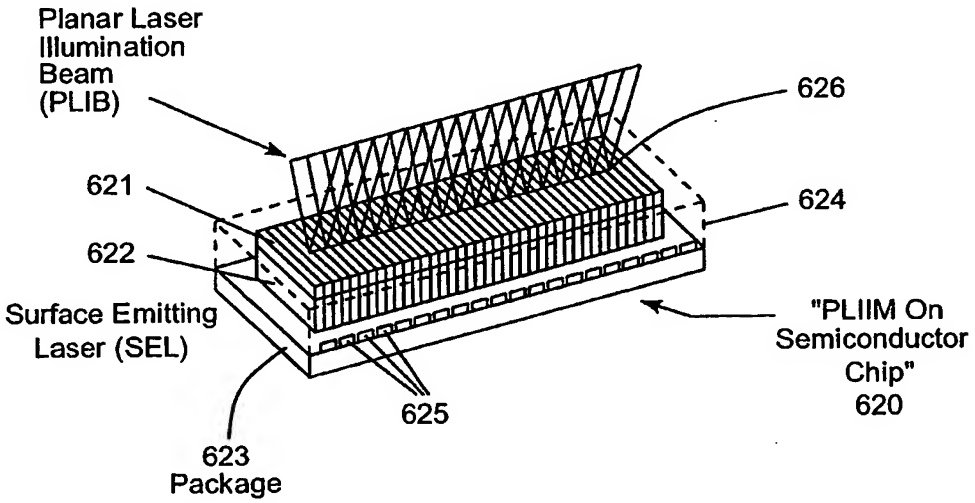


FIG. 35A

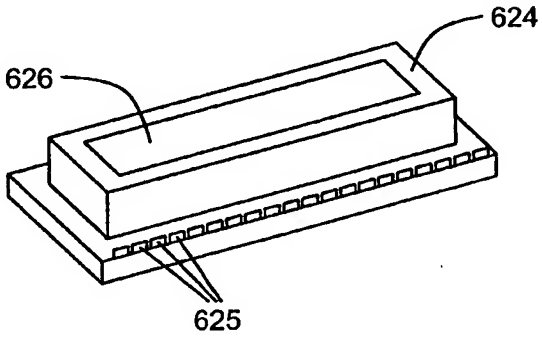


FIG. 35B

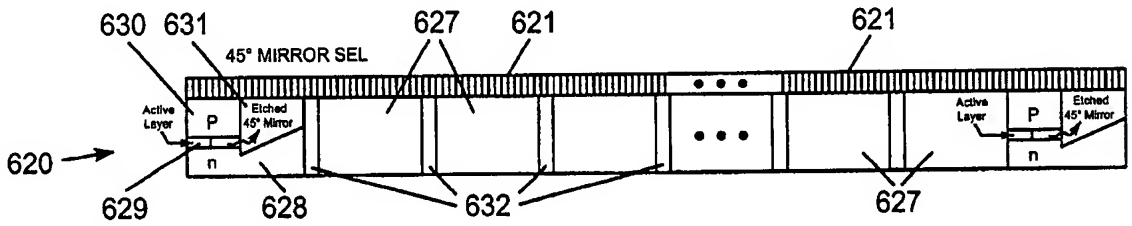


FIG. 36A

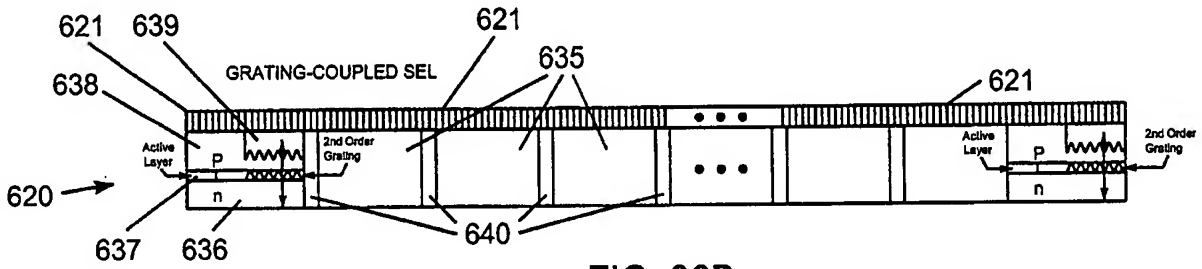


FIG. 36B

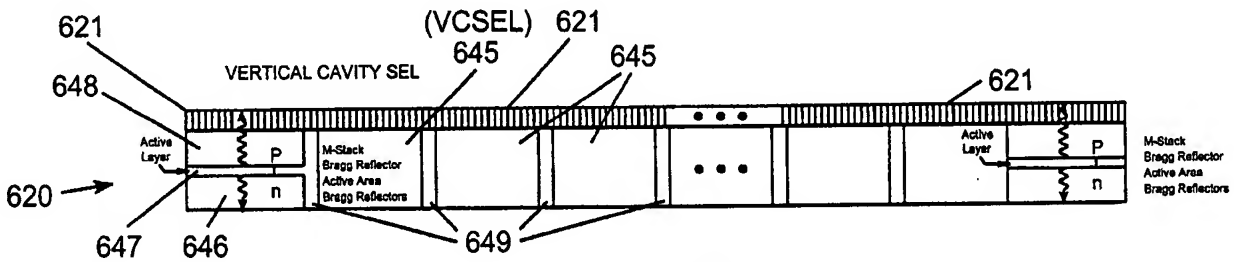


FIG. 36C

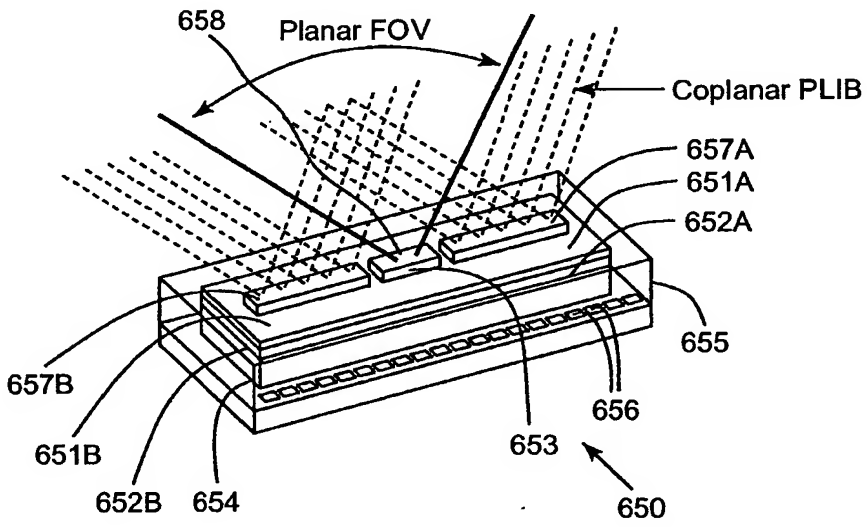

658
Planar FOV
Coplanar PLIB
657A
651A
652A
655
657B
651B
652B
654
653
656
650

FIG. 37

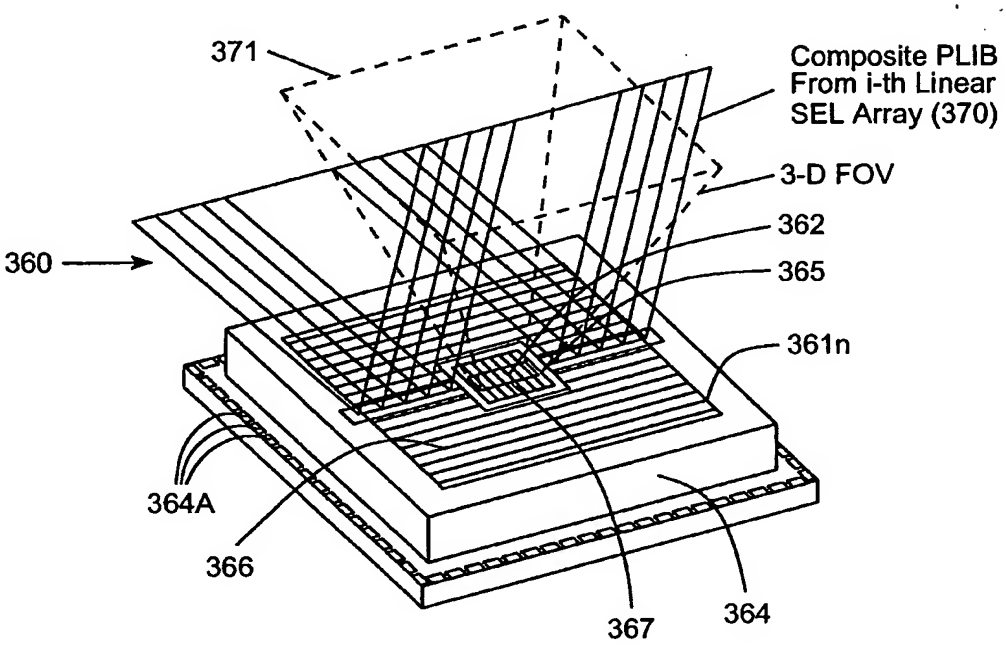


FIG. 38A

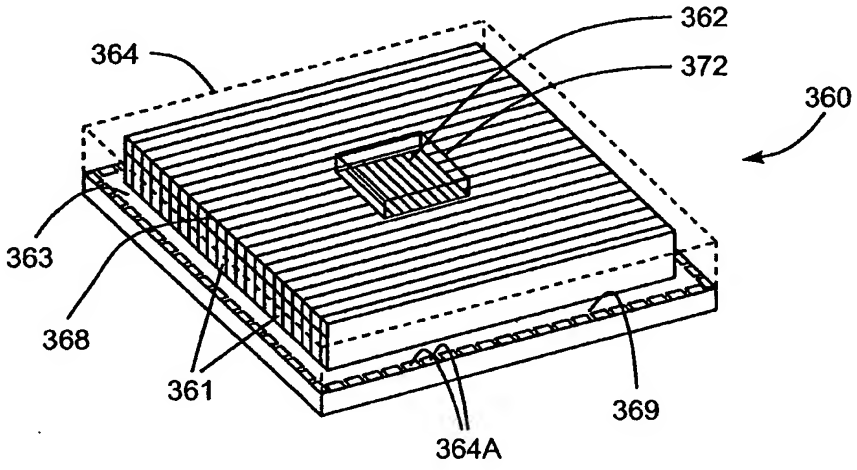


FIG. 38B

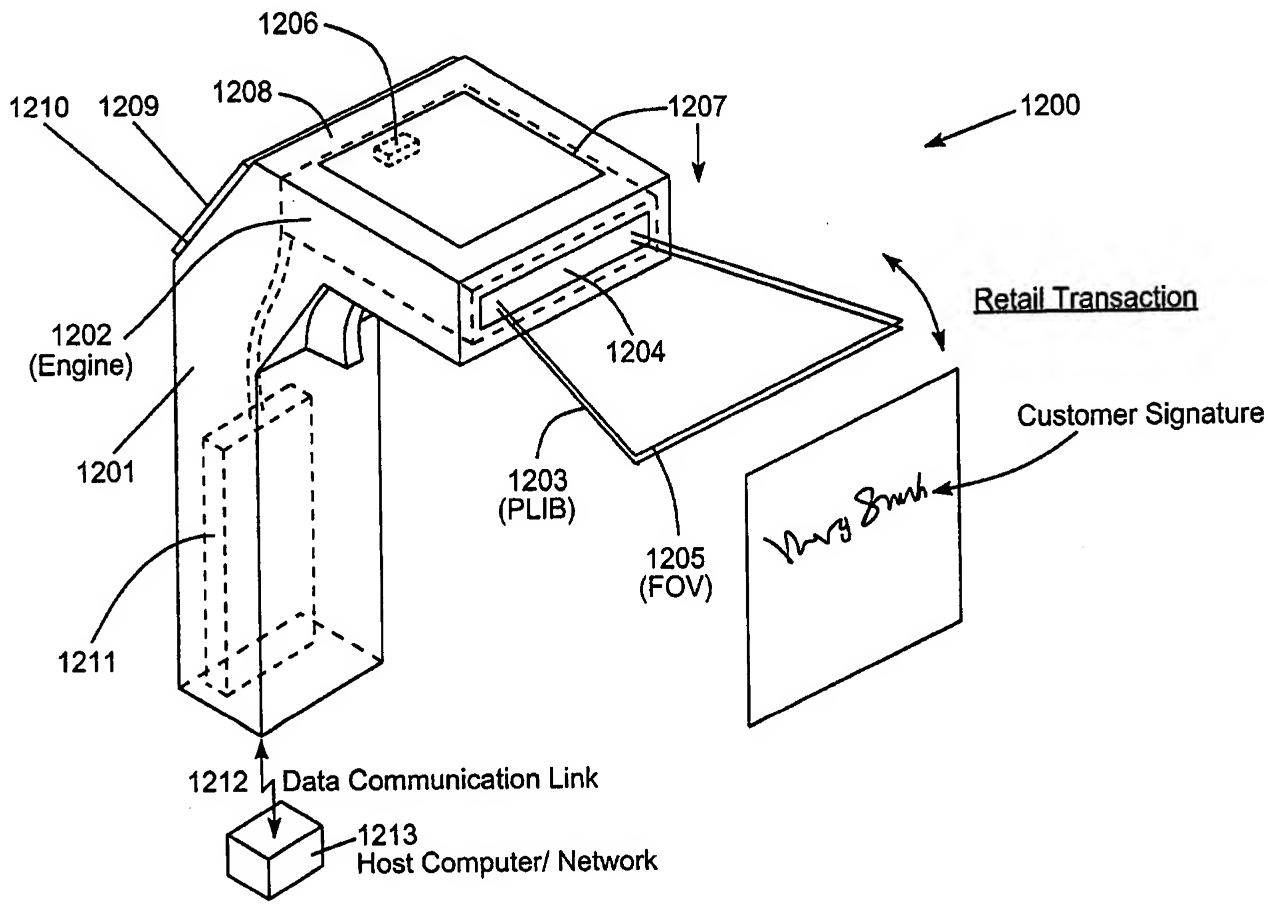

1200
1206
1210
1209
1208
1207
1202
(Engine)
1201
1211
1204
1203
(PLIB)
1205
(FOV)
Retail Transaction
Customer Signature
1212
Data Communication Link
1213
Host Computer/ Network

FIG. 39A

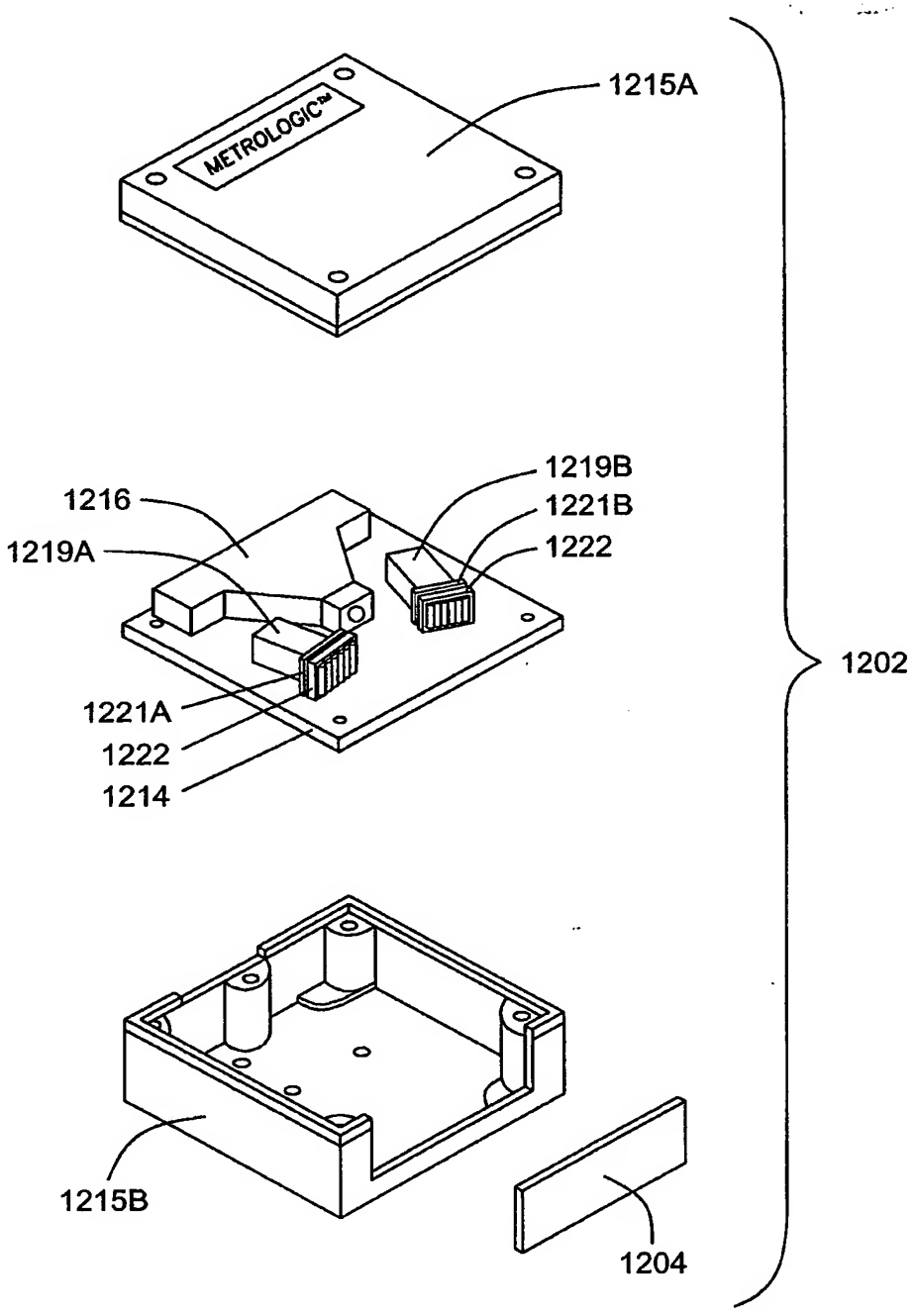

METROLOGIC™
1215A
1216
1219A
1219B
1221B
1222
1221A
1222
1214
1215B
1204
1202

FIG. 39B

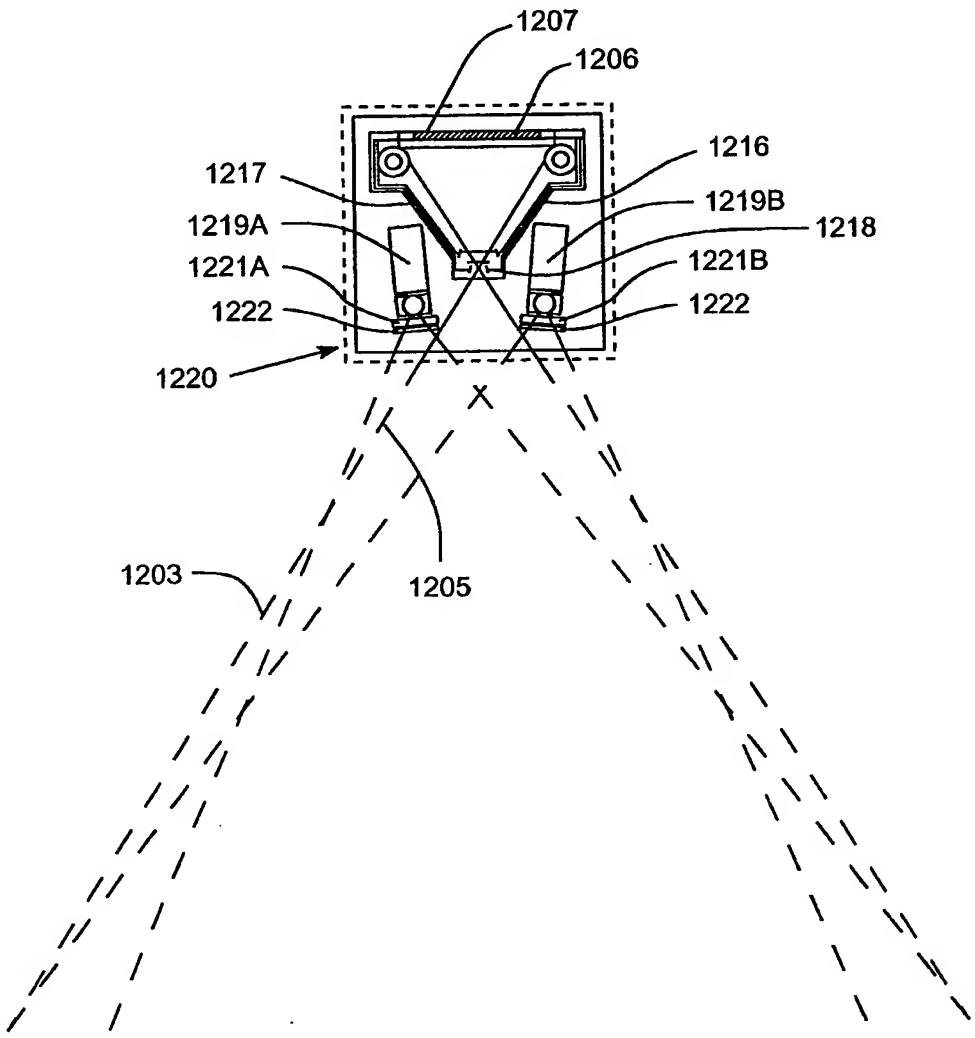

1207
1206
1216
1217
1219B
1219A
1218
1221A
1221B
1222
1222
1220
1203
1205

FIG. 39C

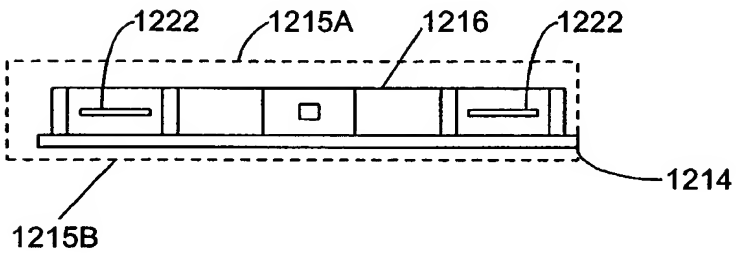


FIG. 39D

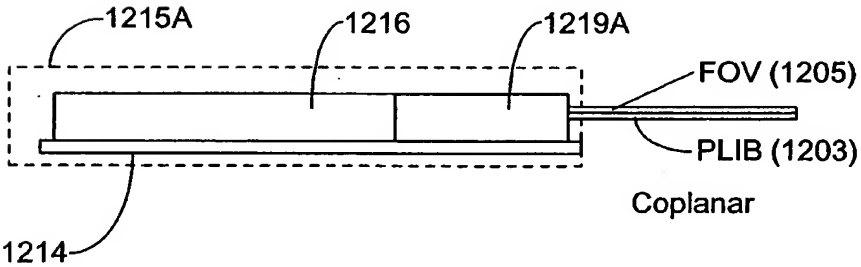


FIG. 39E

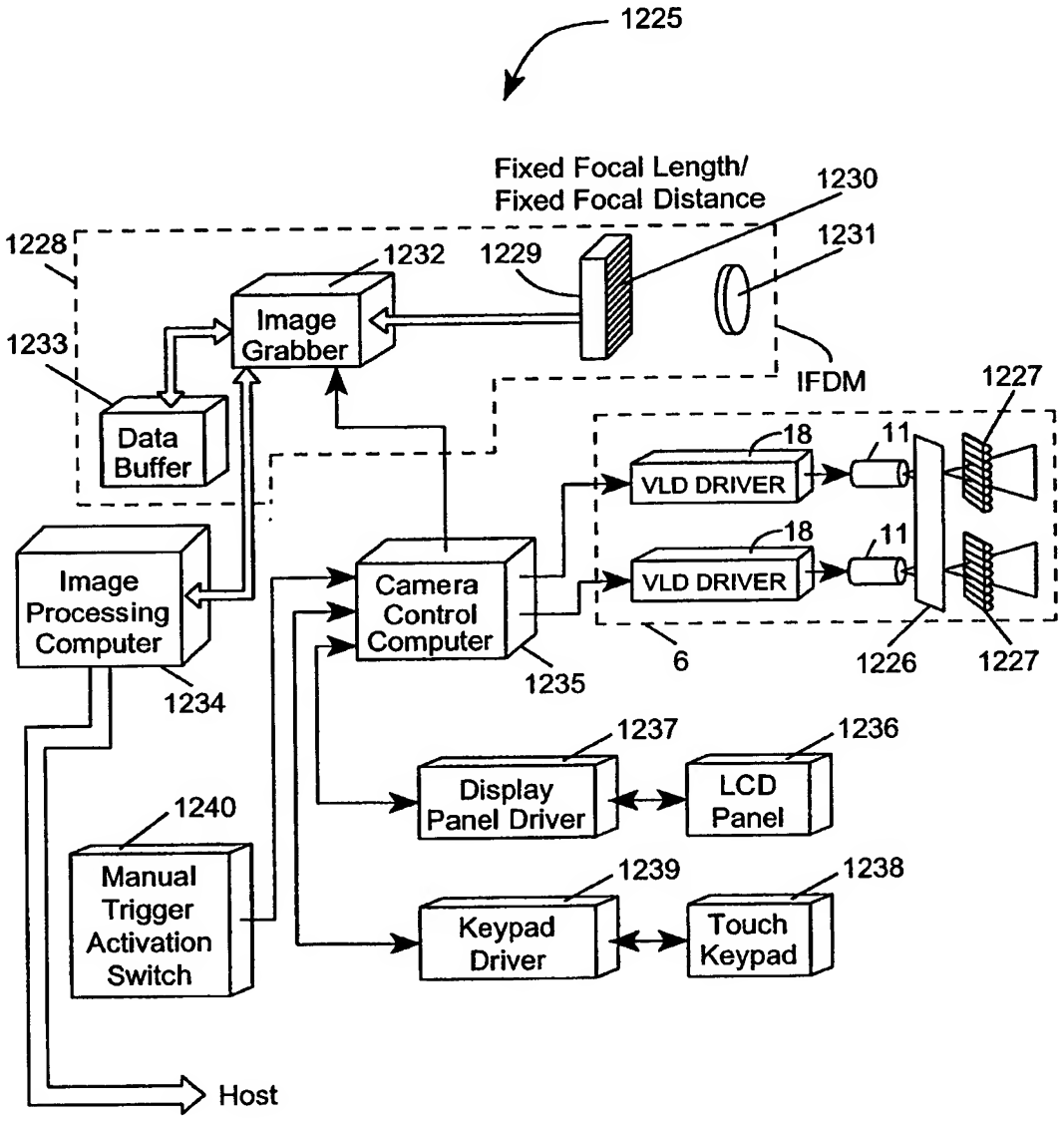
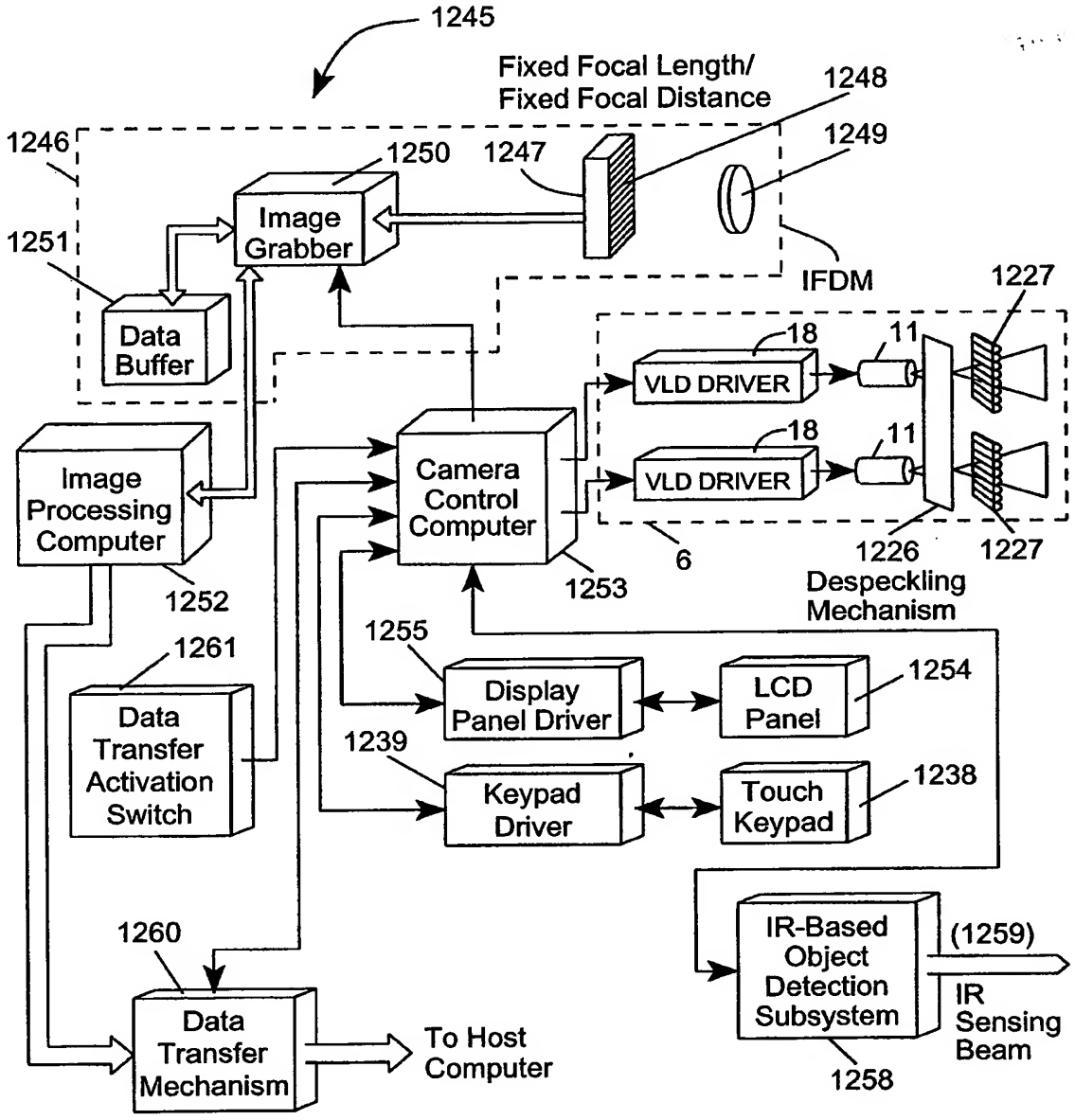
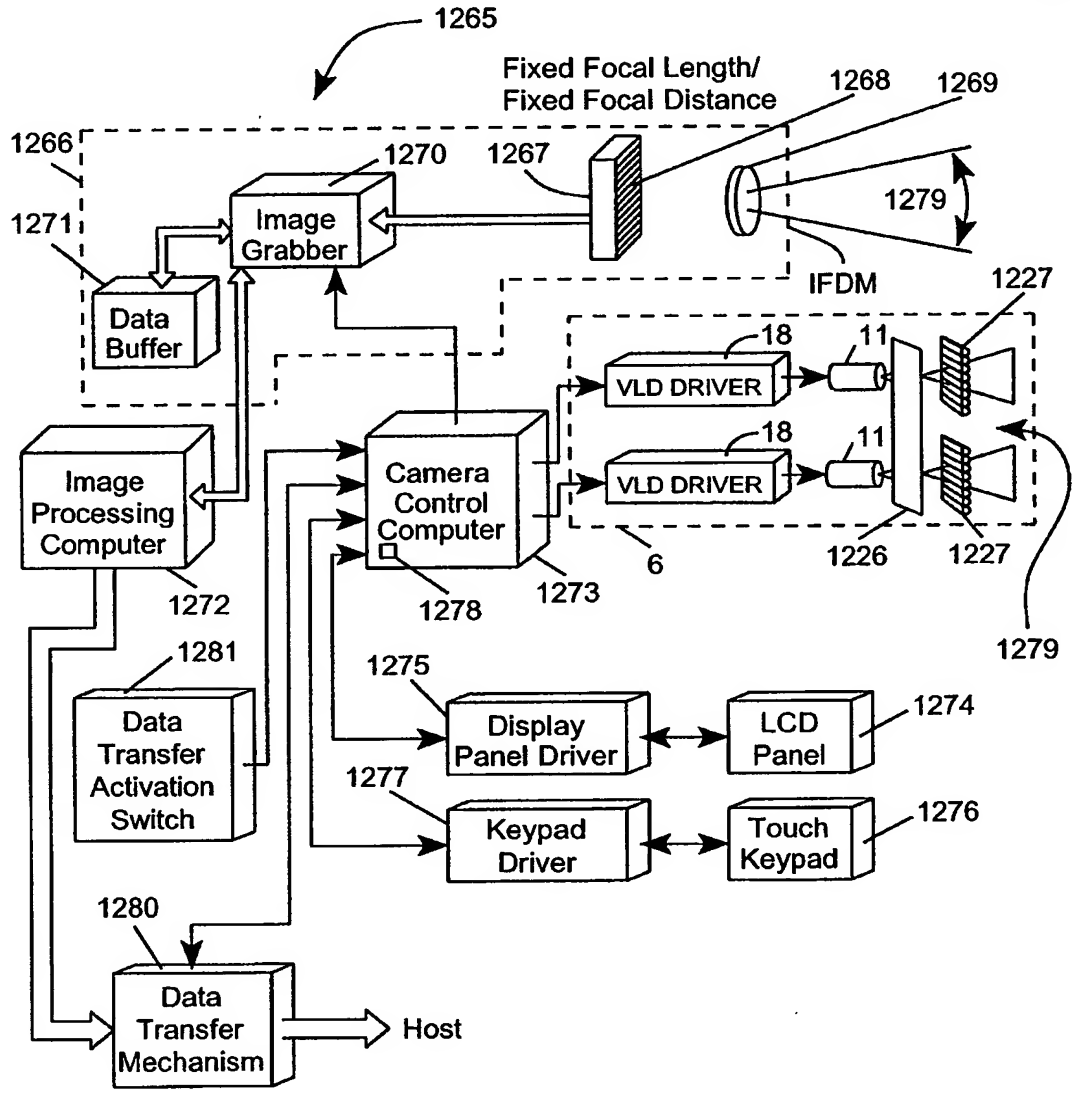

1225
Fixed Focal Length/
Fixed Focal Distance
1230
1231
1228
1232
1229
1233
Image
Grabber
IFDM
1227
Data
Buffer
18
11
VLD DRIVER
18
11
VLD DRIVER
Image
Processing
Computer
Camera
Control
Computer
1235
6
1226
1227
1234
1237
1236
Display
Panel Driver
LCD
Panel
1240
1239
1238
Manual
Trigger
Activation
Switch
Keypad
Driver
Touch
Keypad
Host

FIG. 40A1



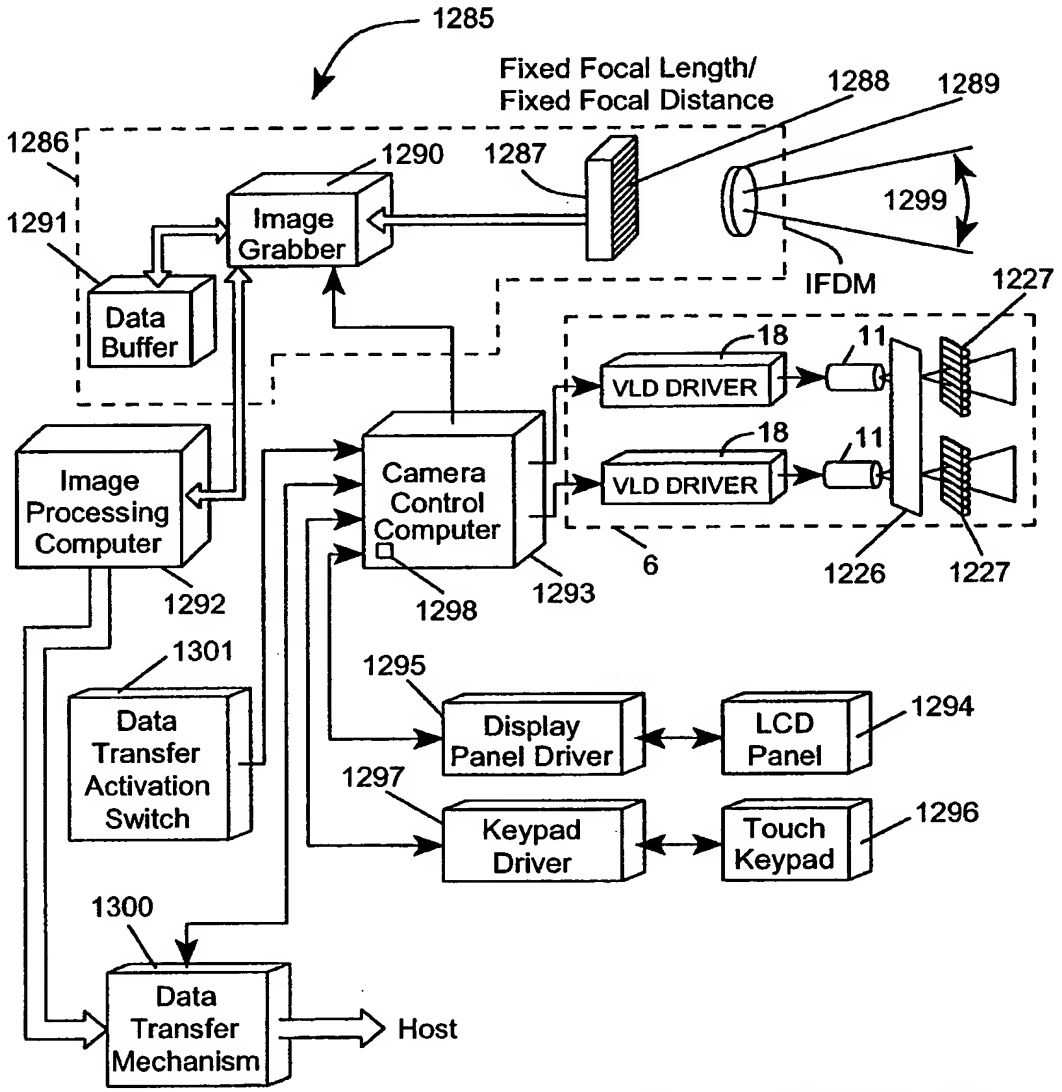
Automatic with IR Object Detection

FIG. 40A2



Automatic with Laser Based Object Detection

FIG. 40A3



Automatic with Passive CCD
Based Object Detection

FIG. 40A4

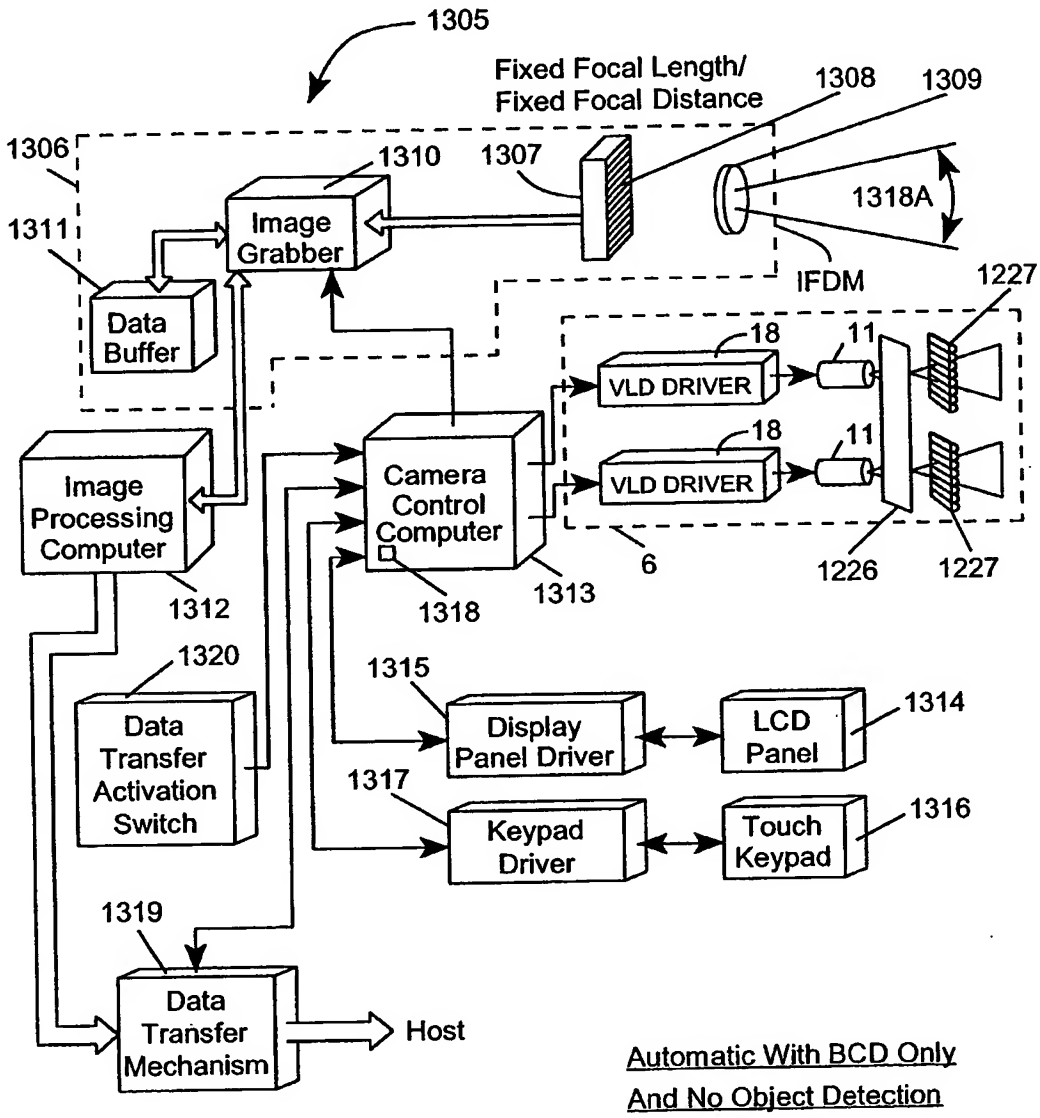

1305
Fixed Focal Length/
Fixed Focal Distance
1308
1309
1306
1310
1307
1318A
1311
Image
Grabber
IFDM
1227
Data
Buffer
18
11
VLD DRIVER
18
11
VLD DRIVER
Image
Processing
Computer
Camera
Control
Computer
6
1226
1227
1312
1318
1313
1320
1315
Data
Transfer
Activation
Switch
Display
Panel Driver
LCD
Panel
1314
1317
Keypad
Driver
Touch
Keypad
1316
1319
Data
Transfer
Mechanism
Host
Automatic With BCD Only
And No Object Detection

FIG. 40A5

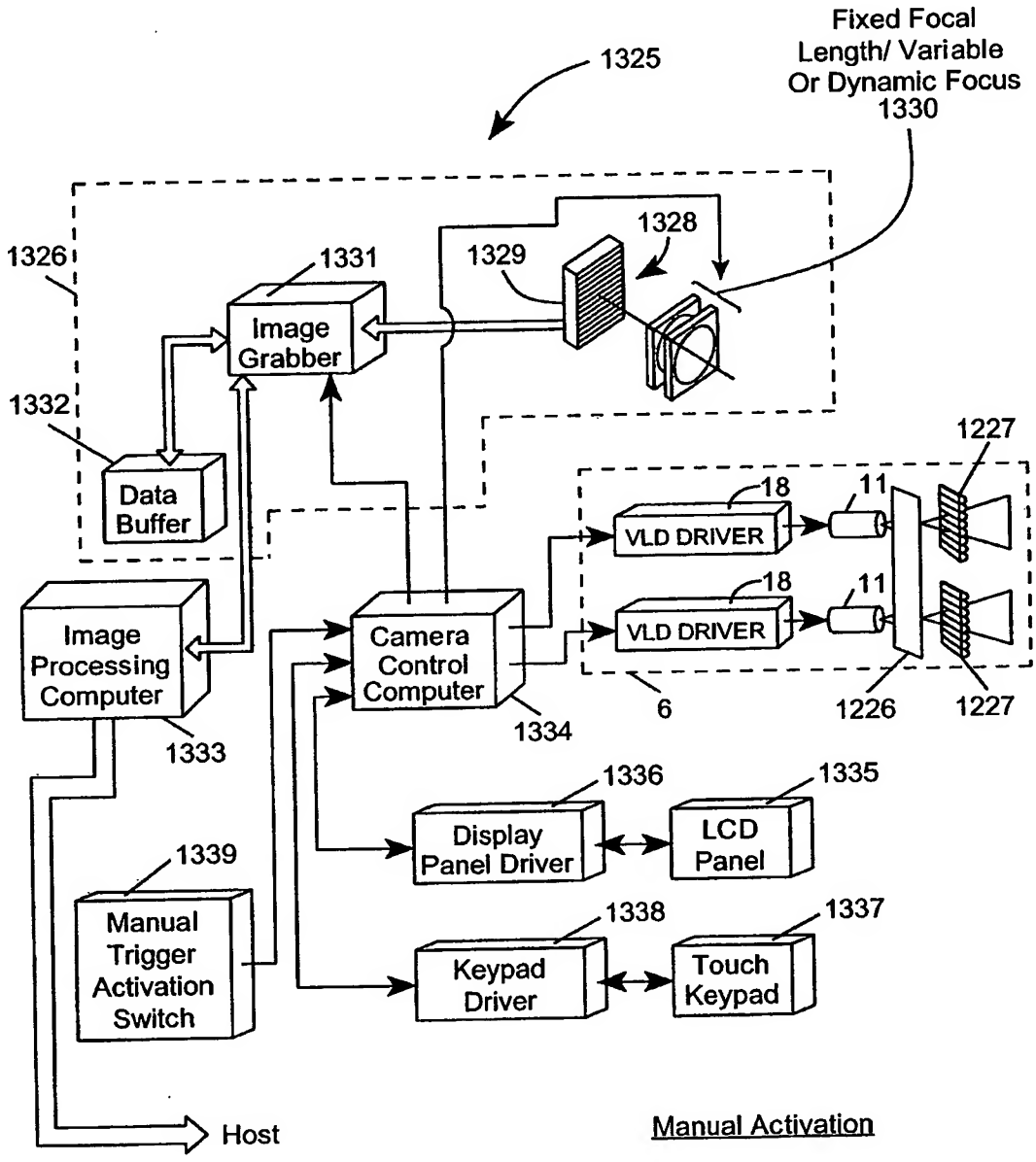
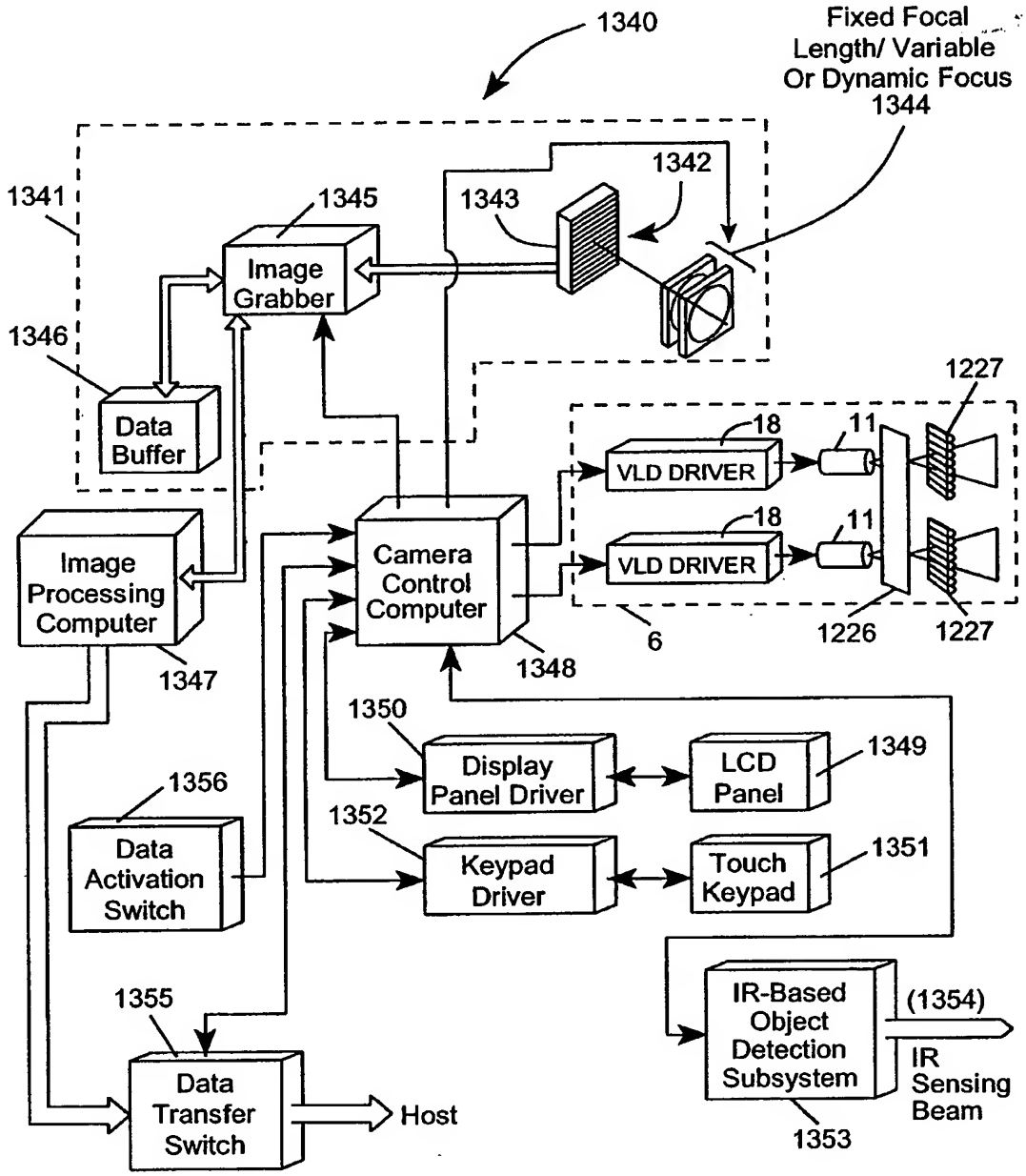

Fixed Focal
Length/ Variable
Or Dynamic Focus
1330
1325
1326
1331
1329
1328
Image
Grabber
1332
Data
Buffer
1227
18
11
VLD DRIVER
18
11
VLD DRIVER
Image
Processing
Computer
Camera
Control
Computer
1333
1334
6
1226
1227
1336
1335
Display
Panel Driver
LCD
Panel
1339
1338
1337
Manual
Trigger
Activation
Switch
Keypad
Driver
Touch
Keypad
Host
Manual Activation

FIG. 40B1



Automatic With IR-Based Object Detection

FIG. 40B2

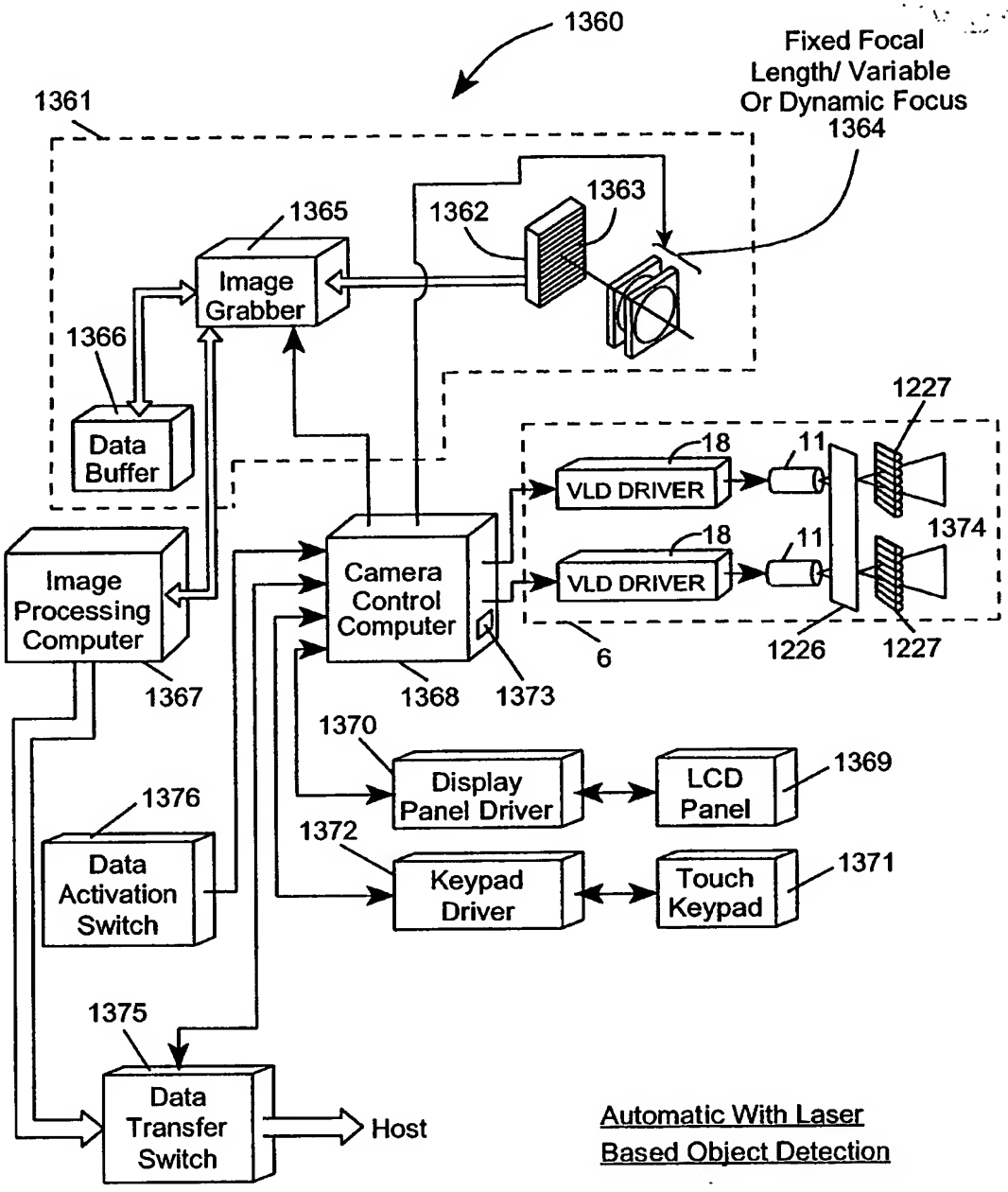
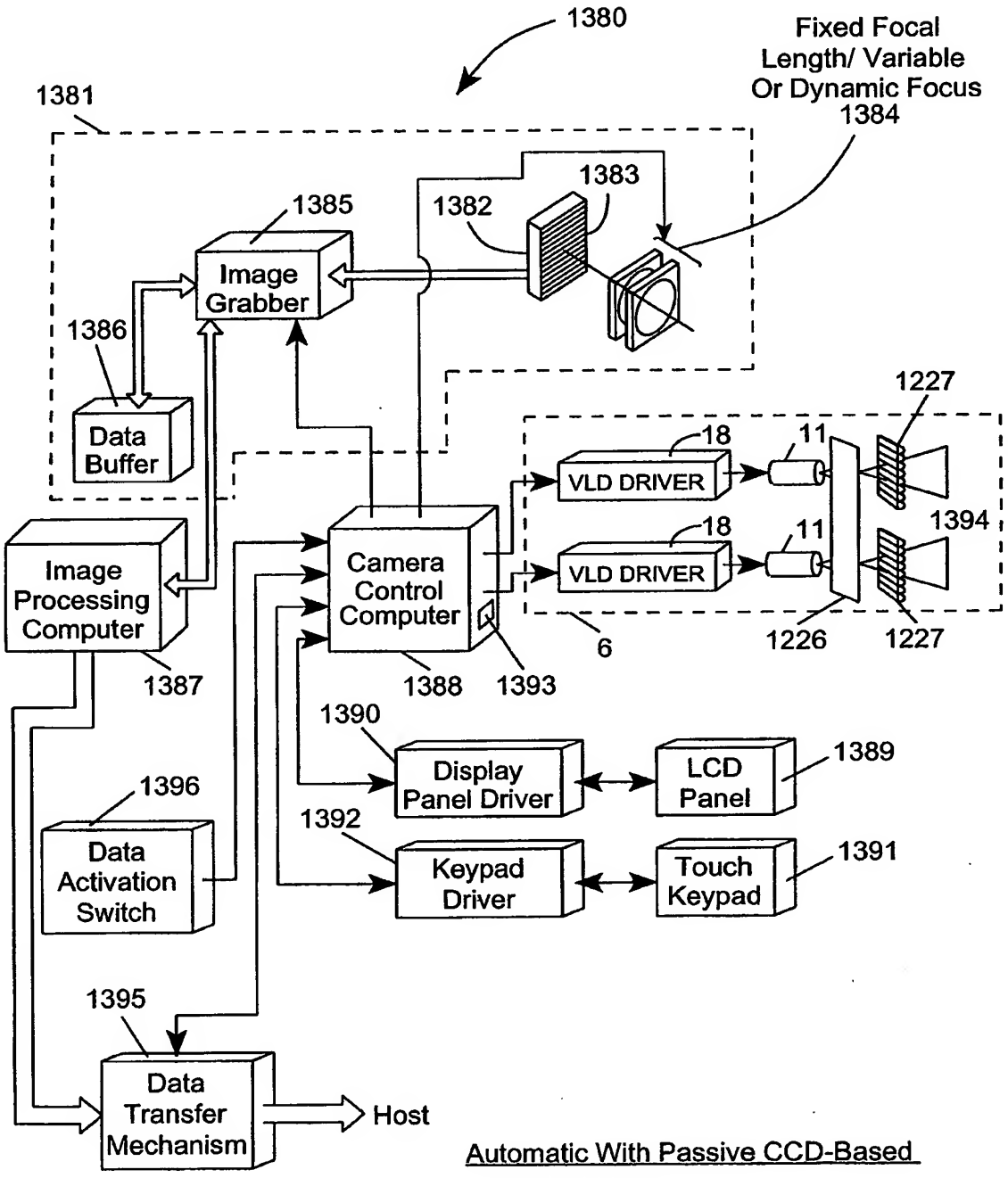

1360
Fixed Focal Length/ Variable Or Dynamic Focus
1364
1361
1363
1362
1365
Image Grabber
1366
Data Buffer
1227
18
11
VLD DRIVER
18
11
VLD DRIVER
1374
Image Processing Computer
Camera Control Computer
6
1226
1227
1367
1368
1373
1370
Display Panel Driver
LCD Panel
1369
1376
Data Activation Switch
1372
Keypad Driver
Touch Keypad
1371
1375
Data Transfer Switch
Host
Automatic With Laser Based Object Detection

FIG. 40B3



Automatic With Passive CCD-Based Object Detection

FIG. 40B4

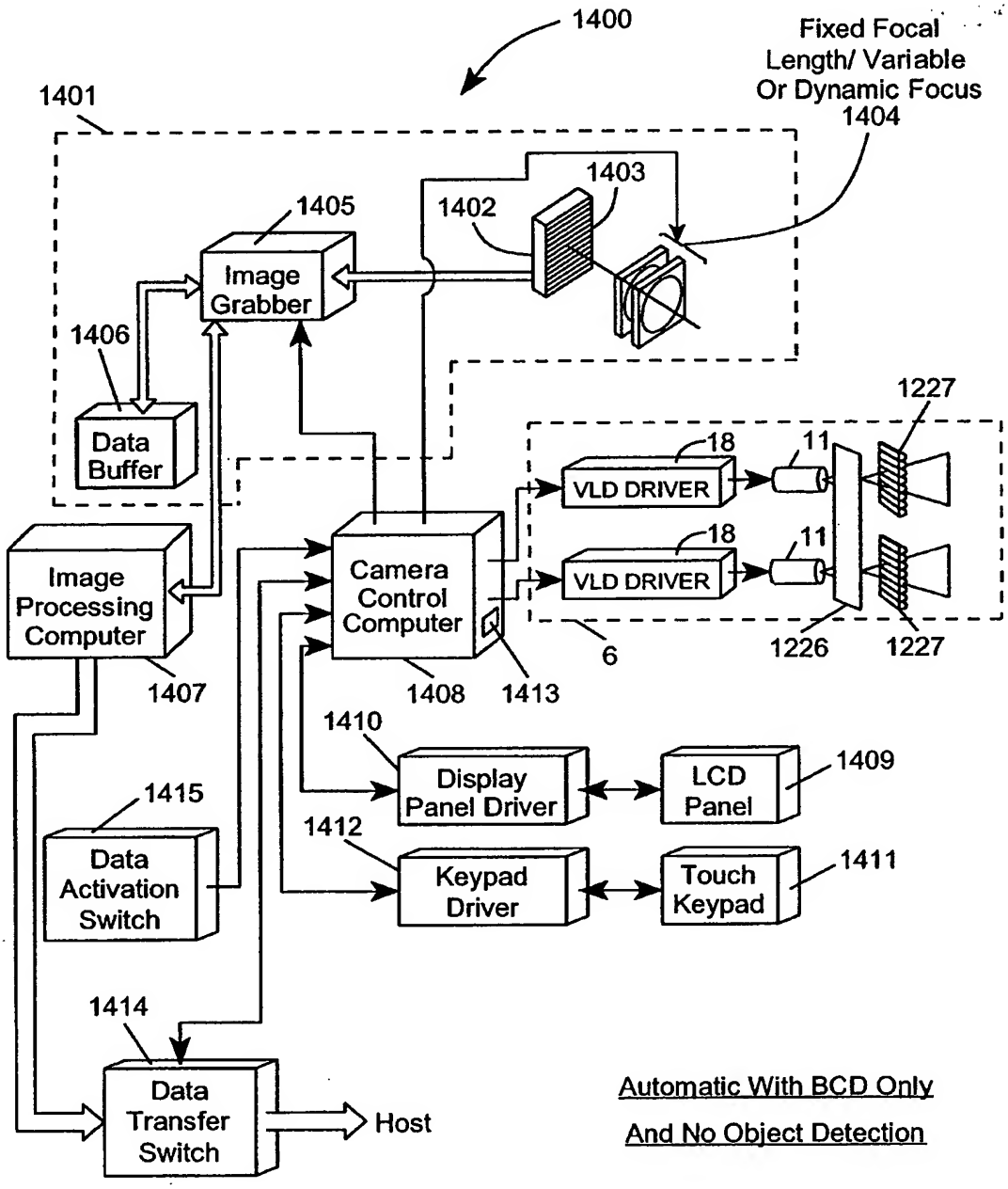

1400
Fixed Focal Length/ Variable Or Dynamic Focus
1404
1401
1403
1402
1405
Image Grabber
1406
Data Buffer
1227
18
11
VLD DRIVER
18
11
VLD DRIVER
Image Processing Computer
Camera Control Computer
6
1226
1227
1407
1408
1413
1410
Display Panel Driver
LCD Panel
1409
1415
1412
Data Activation Switch
Keypad Driver
Touch Keypad
1411
1414
Data Transfer Switch
Host
Automatic With BCD Only
And No Object Detection

FIG. 40B5

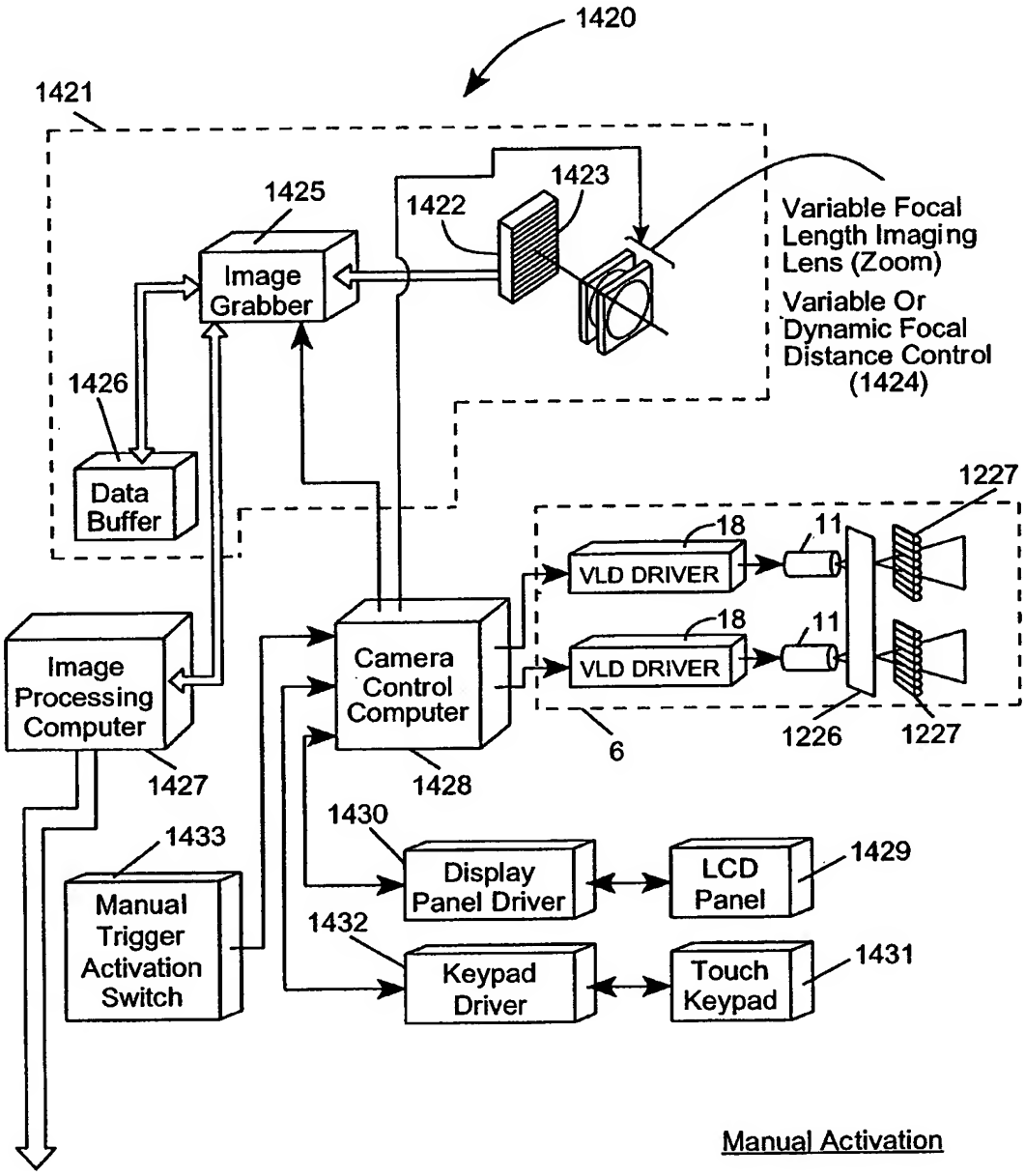

1420
1421
1425
1423
1422
Image Grabber
Variable Focal Length Imaging Lens (Zoom)
Variable Or Dynamic Focal Distance Control (1424)
1426
Data Buffer
1227
18
11
VLD DRIVER
18
11
VLD DRIVER
Image Processing Computer
Camera Control Computer
6
1226
1227
1427
1428
1430
1433
Display Panel Driver
LCD Panel
1429
1432
Manual Trigger Activation Switch
Keypad Driver
Touch Keypad
1431
Manual Activation

FIG. 40C1

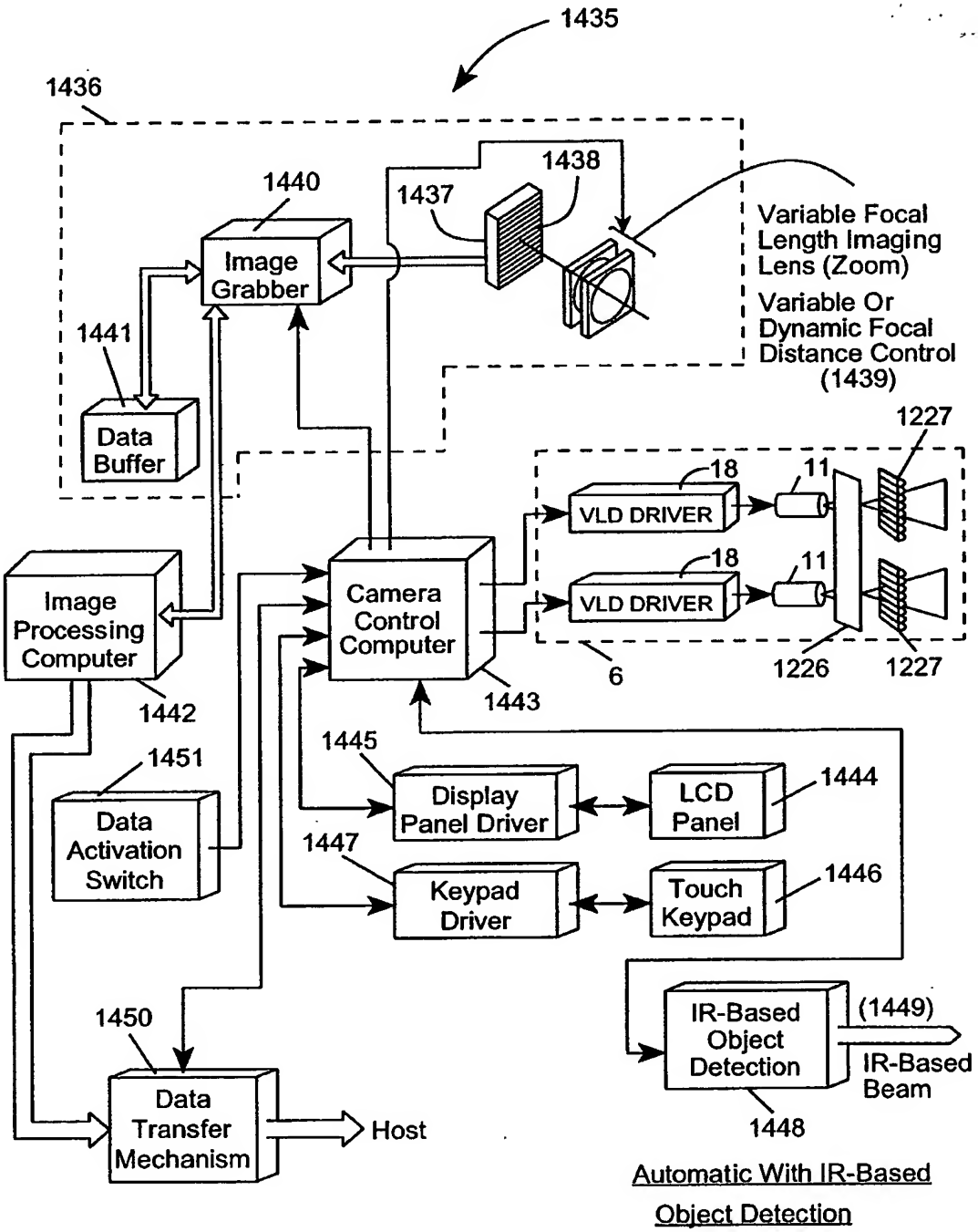

1435
1436
1438
1440
1437
Image Grabber
Variable Focal Length Imaging Lens (Zoom)
Variable Or Dynamic Focal Distance Control (1439)
1441
Data Buffer
1227
18
11
VLD DRIVER
18
11
VLD DRIVER
Image Processing Computer
Camera Control Computer
6
1226
1227
1442
1443
1445
1451
Display Panel Driver
LCD Panel
1444
Data Activation Switch
1447
Keypad Driver
Touch Keypad
1446
1450
IR-Based Object Detection
(1449)
IR-Based Beam
Data Transfer Mechanism
Host
1448
Automatic With IR-Based Object Detection

FIG. 40C2

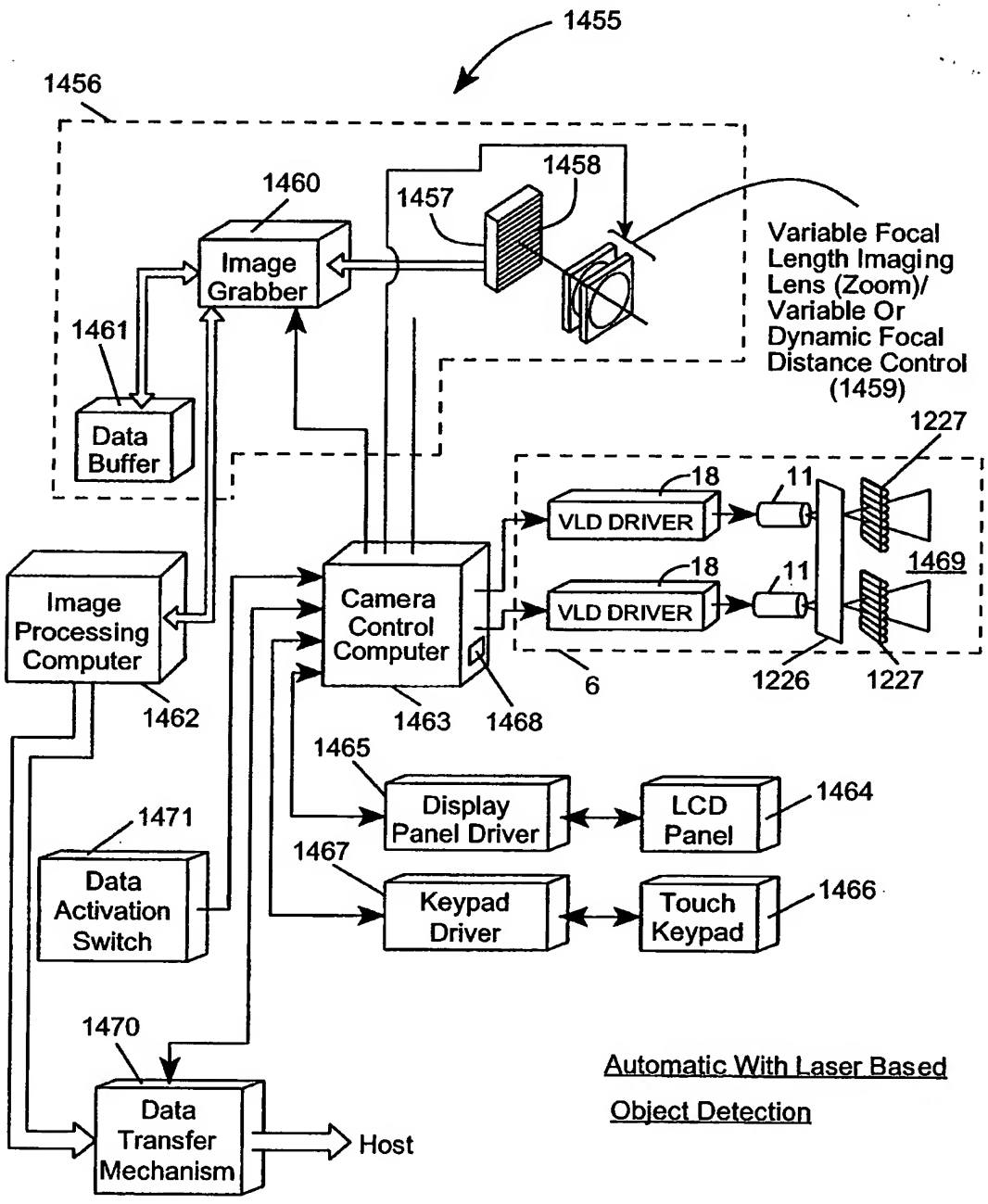

1455
1456
1460
1458
1457
Image Grabber
Variable Focal Length Imaging Lens (Zoom)/ Variable Or Dynamic Focal Distance Control (1459)
1461
Data Buffer
1227
18
11
VLD DRIVER
18
11
VLD DRIVER
1469
Image Processing Computer
Camera Control Computer
1462
1463
1468
6
1226
1227
1465
Display Panel Driver
LCD Panel
1464
1471
1467
Data Activation Switch
Keypad Driver
Touch Keypad
1466
1470
Data Transfer Mechanism
Host
Automatic With Laser Based Object Detection

FIG. 40C3

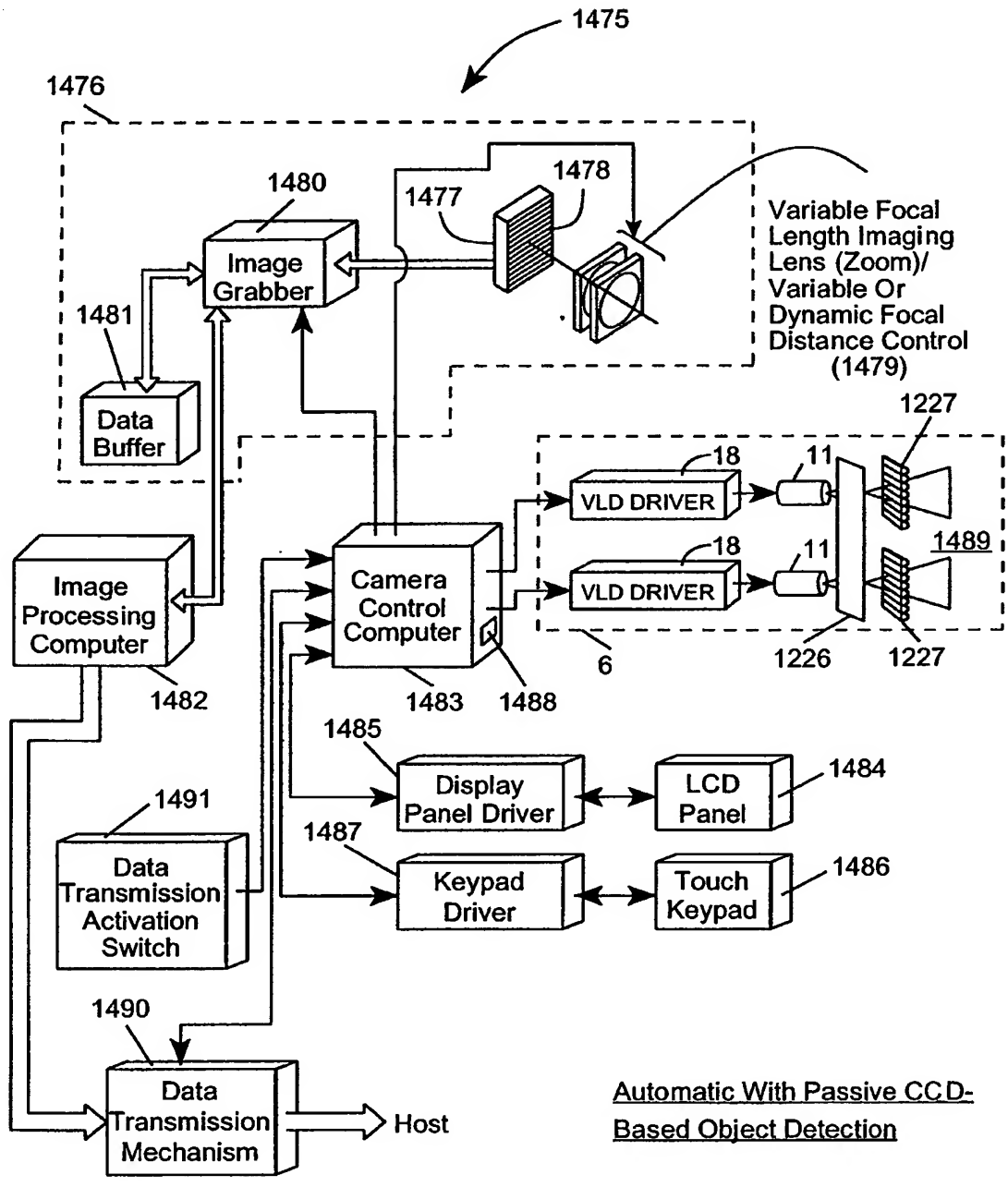

1475
1476
1480
1478
1477
Variable Focal Length Imaging Lens (Zoom)/ Variable Or Dynamic Focal Distance Control (1479)
Image Grabber
1481
Data Buffer
1227
18
11
VLD DRIVER
18
11
VLD DRIVER
1489
Image Processing Computer
Camera Control Computer
1482
1483
1488
6
1226
1227
1485
Display Panel Driver
LCD Panel
1484
1491
1487
Data Transmission Activation Switch
Keypad Driver
Touch Keypad
1486
1490
Data Transmission Mechanism
Host
Automatic With Passive CCD-Based Object Detection

FIG. 40C4

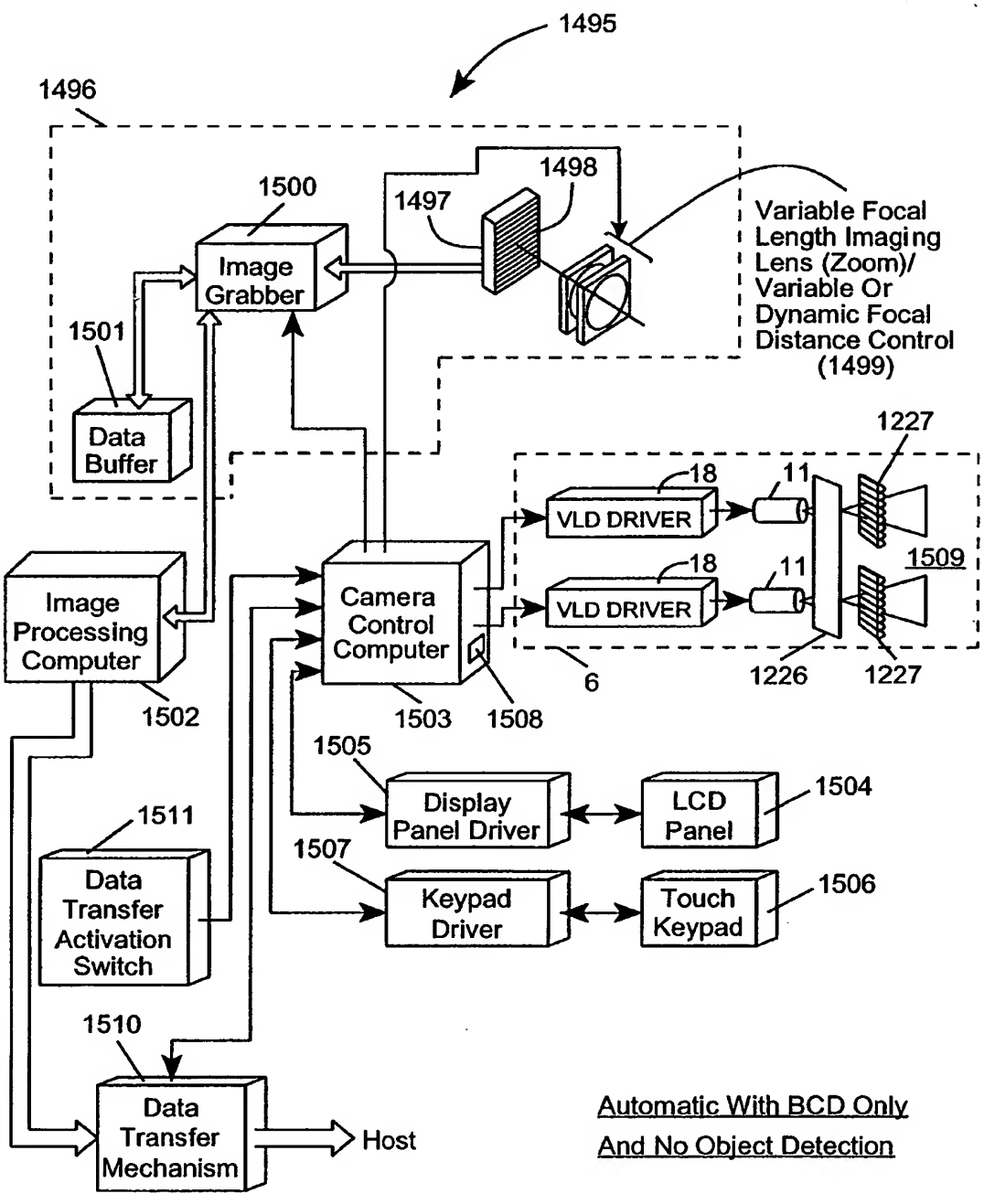

1495
1496
1500
1498
1497
Variable Focal Length Imaging Lens (Zoom)/ Variable Or Dynamic Focal Distance Control (1499)
Image Grabber
1501
Data Buffer
1227
18
11
VLD DRIVER
1509
Image Processing Computer
Camera Control Computer
1502
1503
1508
6
1226
1227
1505
Display Panel Driver
LCD Panel
1504
1511
1507
Data Transfer Activation Switch
Keypad Driver
Touch Keypad
1506
1510
Data Transfer Mechanism
Host
Automatic With BCD Only
And No Object Detection

FIG. 40C5

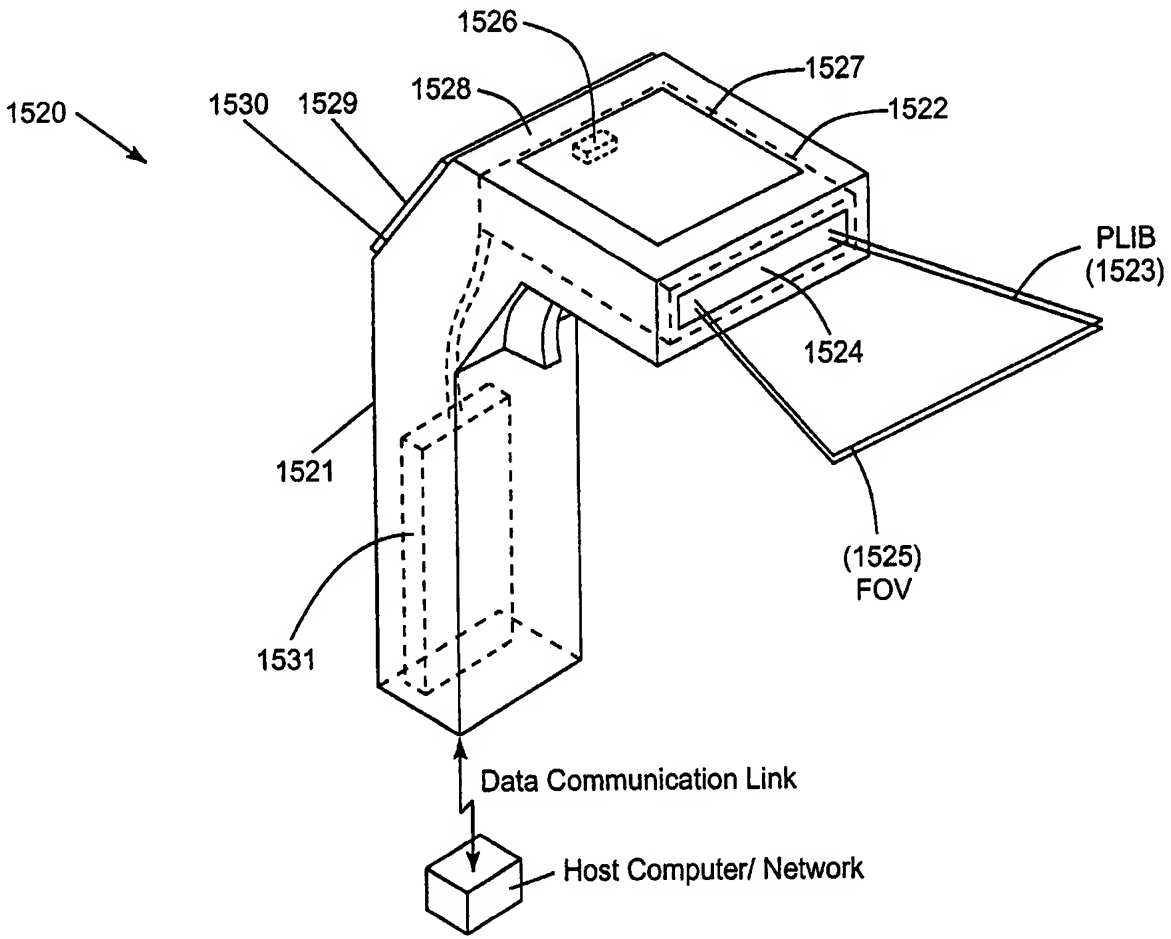

1526
1527
1528
1530
1529
1520
1522
PLIB
(1523)
1524
1521
(1525)
FOV
1531
Data Communication Link
Host Computer/ Network

FIG. 41A

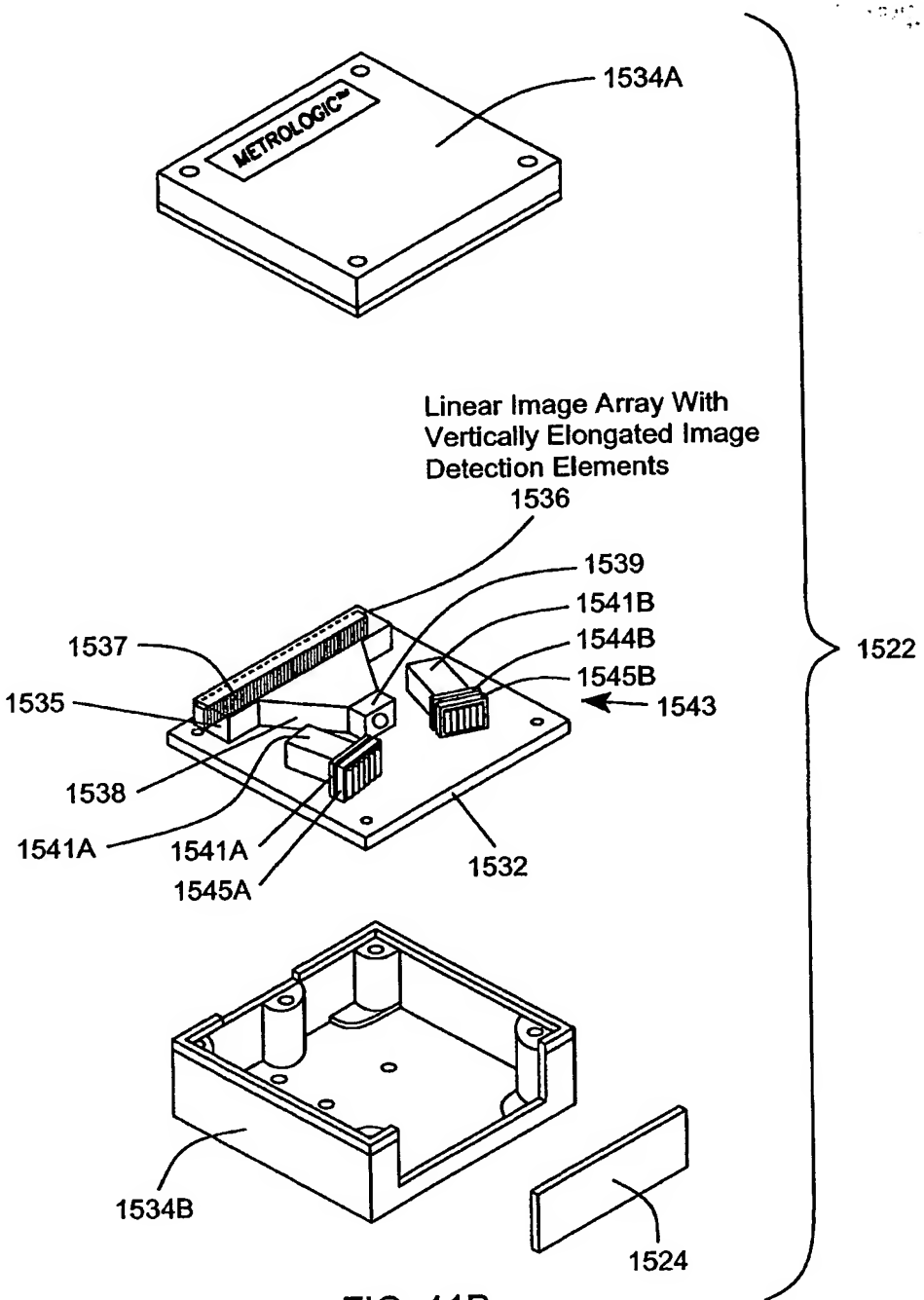

1534A
METROLOGIC
Linear Image Array With
Vertically Elongated Image
Detection Elements
1536
1539
1541B
1544B
1545B
1543
1537
1535
1538
1541A
1541A
1545A
1532
1522
1534B
1524

FIG. 41B

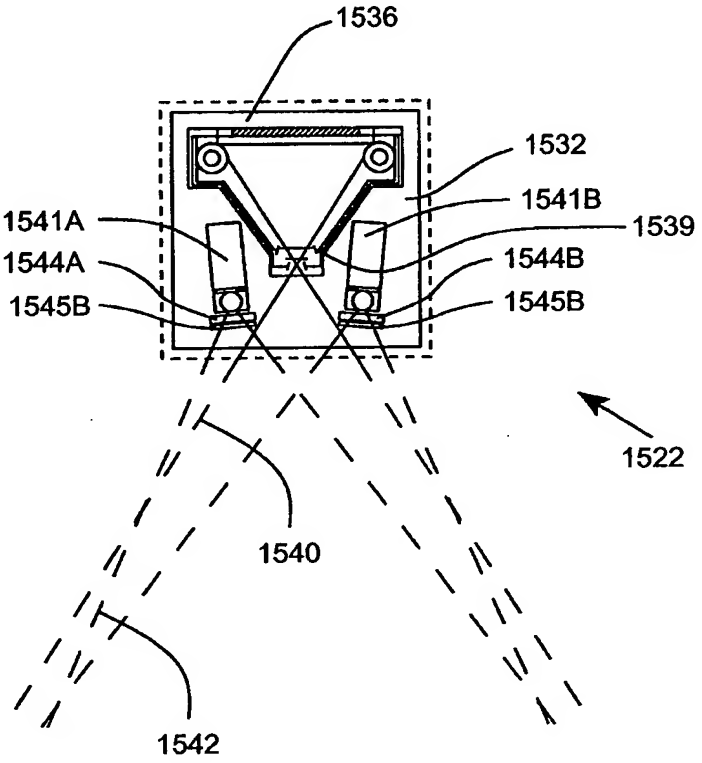


FIG. 41C

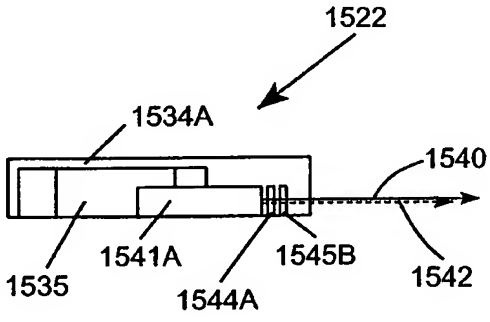


FIG. 41D

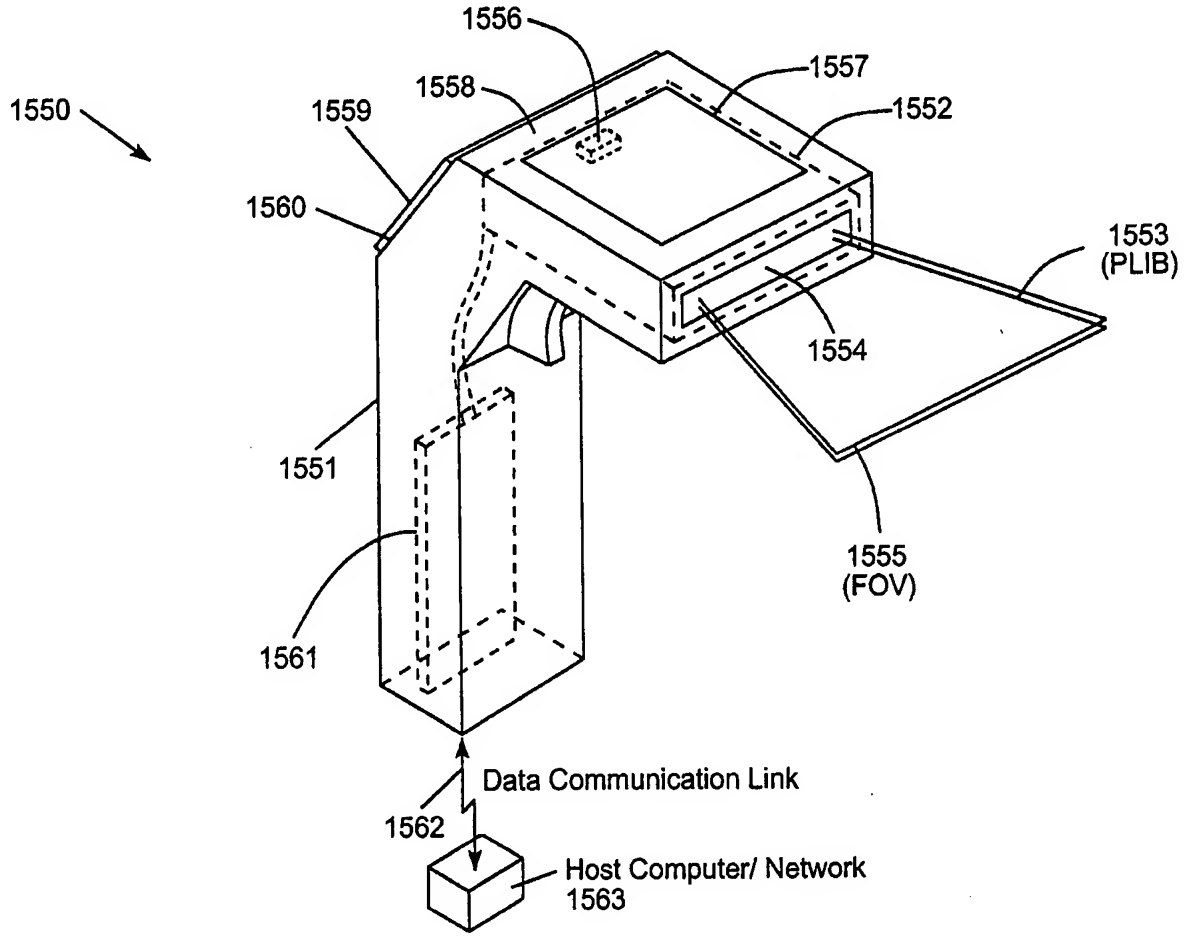

1556
1557
1558
1559
1550
1552
1560
1553
(PLIB)
1554
1551
1555
(FOV)
1561
Data Communication Link
1562
Host Computer/ Network
1563

FIG. 42A

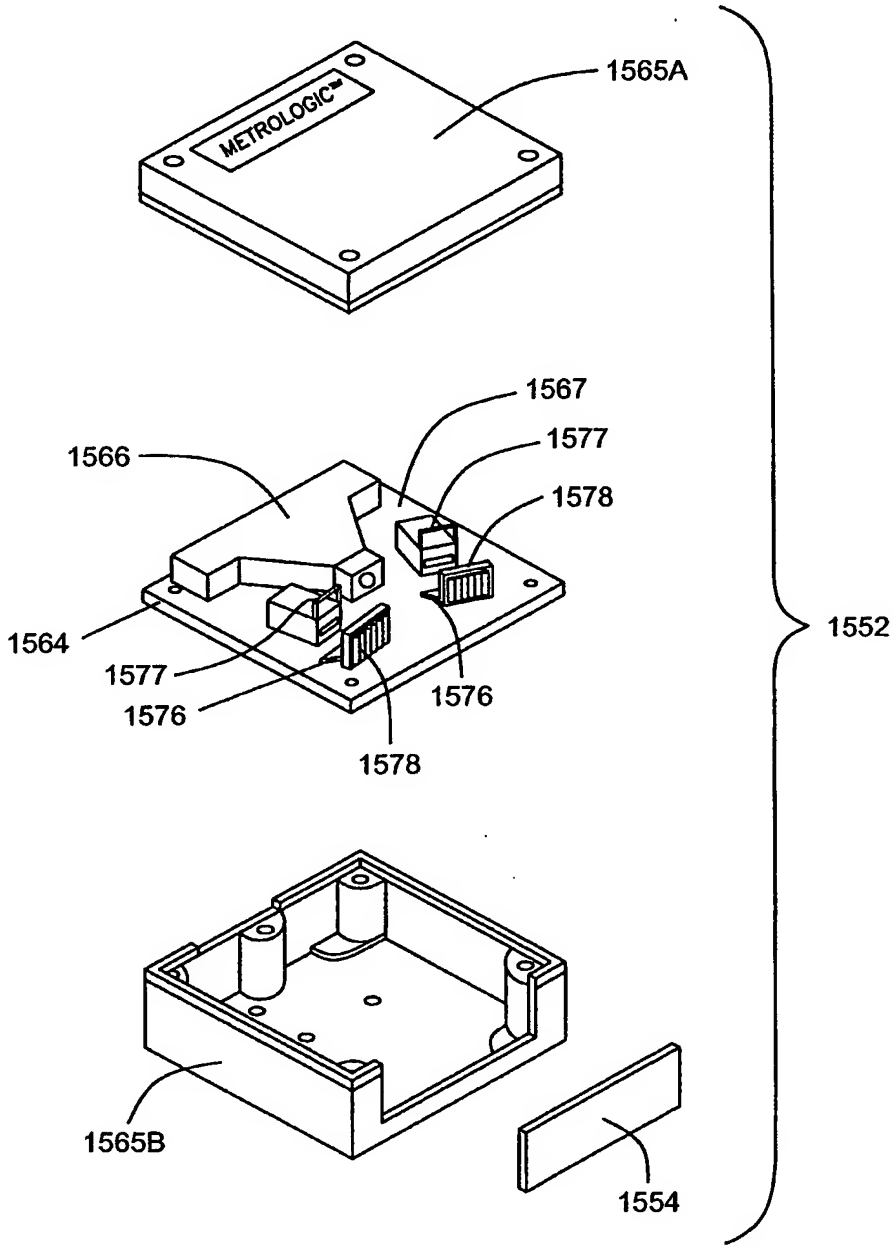

METROLOGIC
1565A
1567
1577
1578
1566
1564
1577
1576
1576
1578
1552
1565B
1554

FIG. 42B

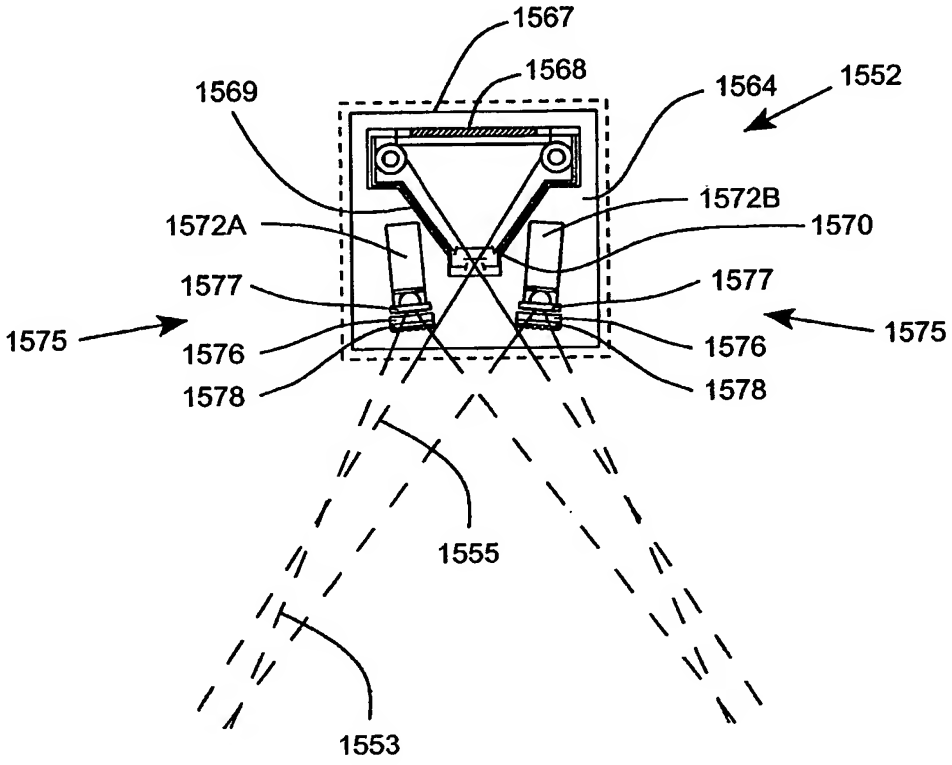


FIG. 42C

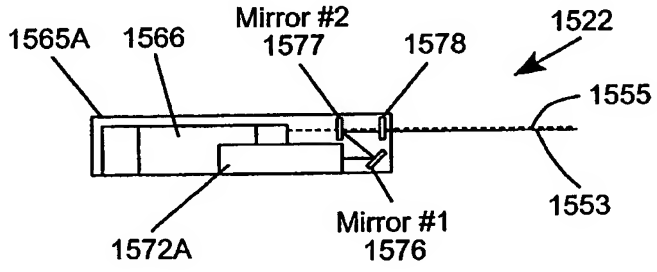


FIG. 42D

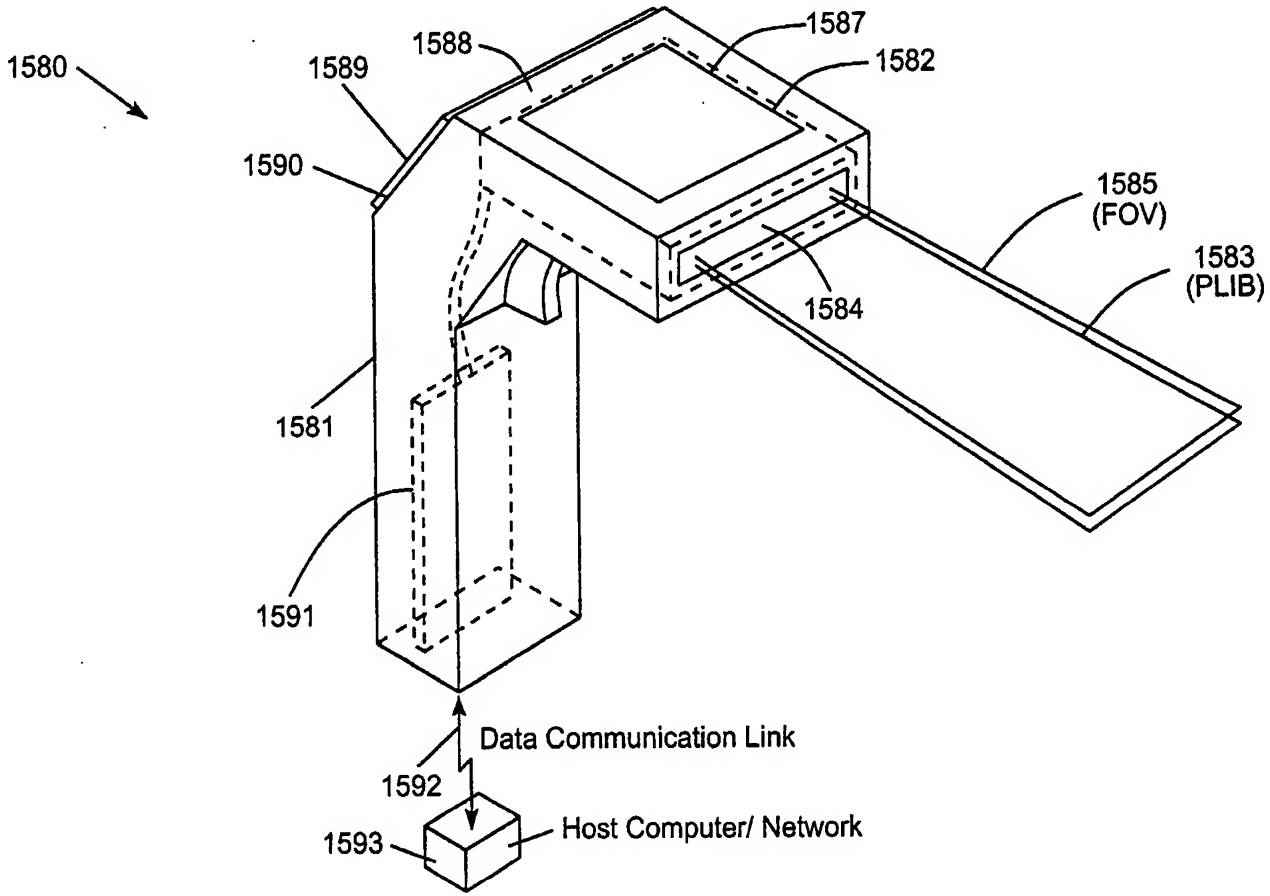

1580
1588
1587
1589
1582
1590
1585
(FOV)
1583
(PLIB)
1584
1581
1591
Data Communication Link
1592
1593
Host Computer/ Network

FIG. 43A

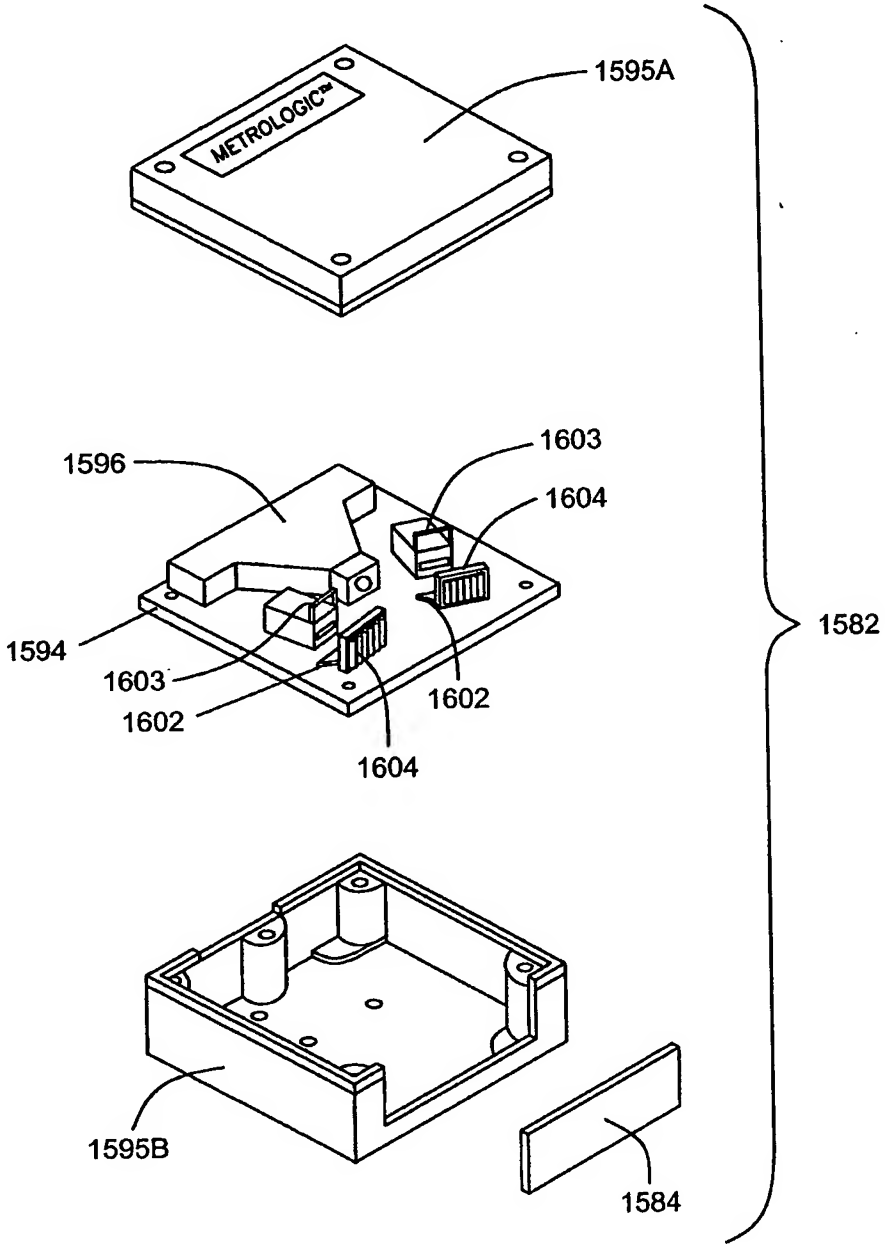

METROLOGIC
1595A
1596
1603
1604
1594
1603
1602
1602
1604
1582
1595B
1584

FIG. 43B

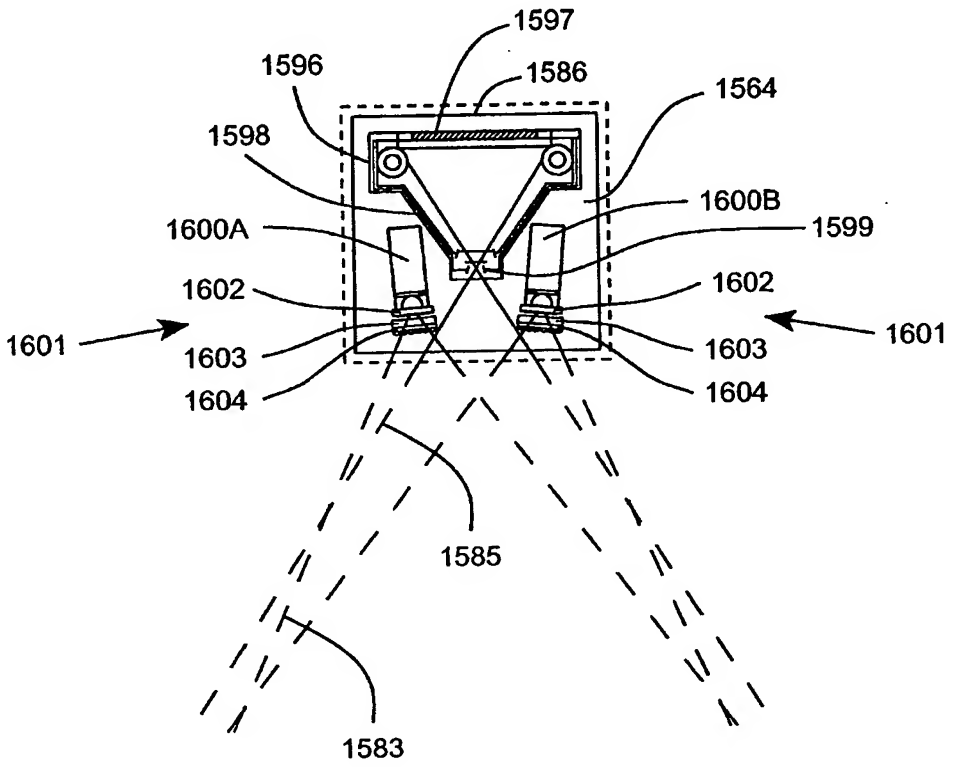


FIG. 43C

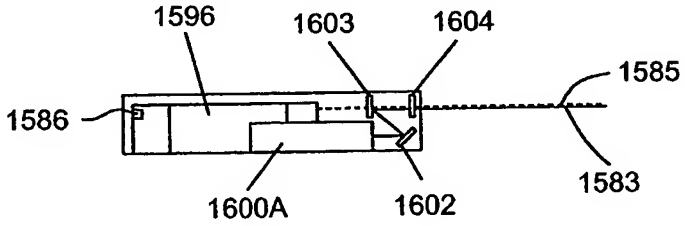


FIG. 43D

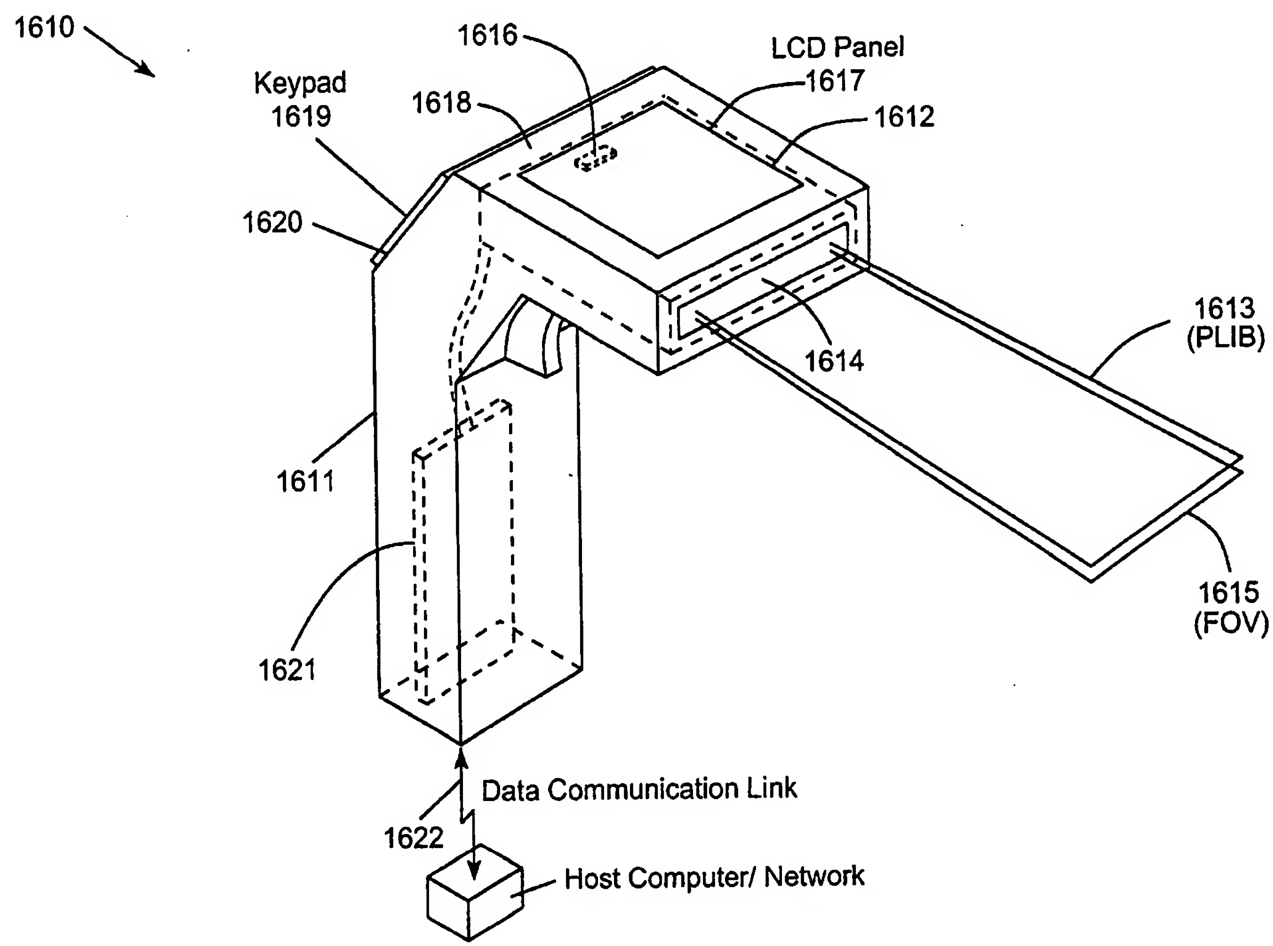

1610
1616
LCD Panel
1617
1612
Keypad
1619
1618
1620
1614
1613
(PLIB)
1611
1621
1615
(FOV)
Data Communication Link
1622
Host Computer/ Network

FIG. 44A

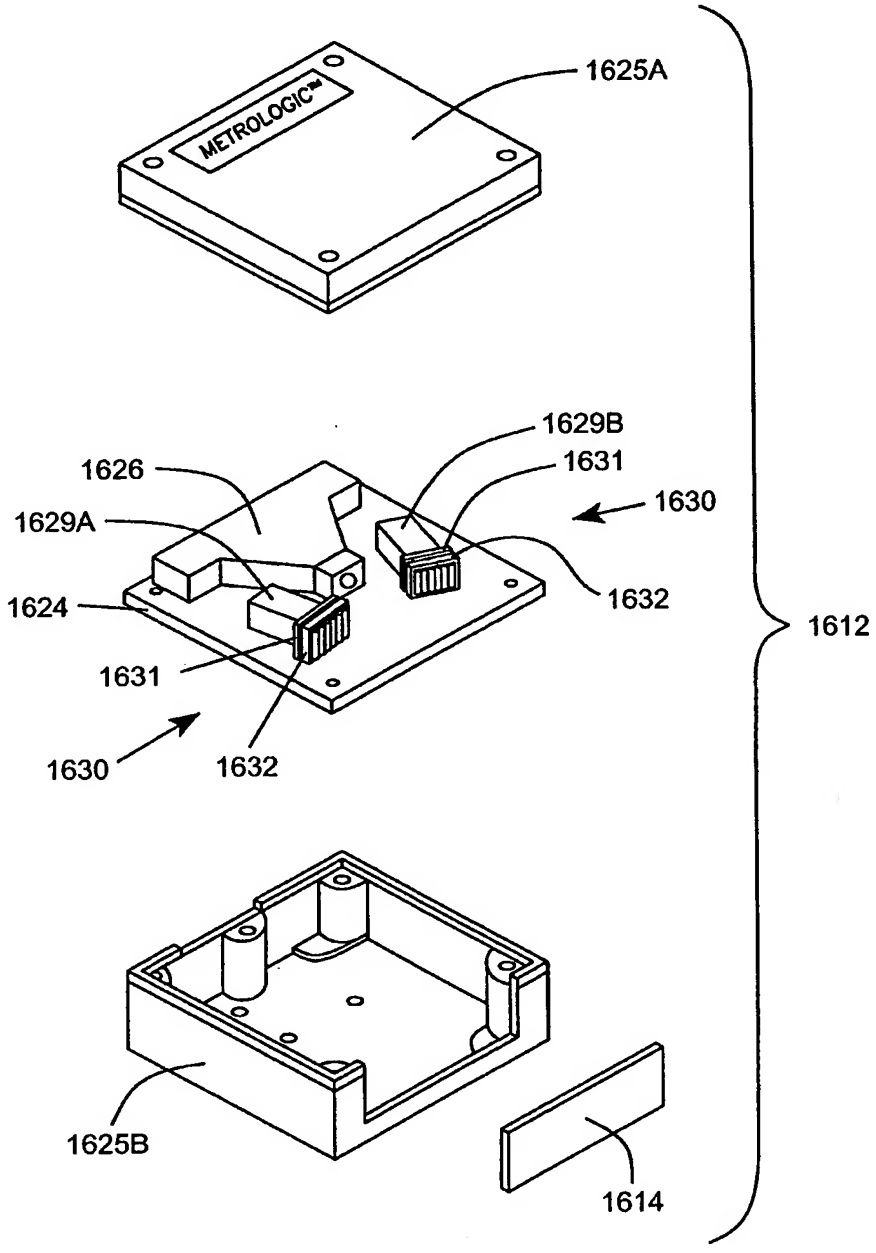

METROLOGIC℠
1625A
1629B
1631
1630
1626
1629A
1624
1632
1631
1630
1632
1612
1625B
1614

FIG. 44B

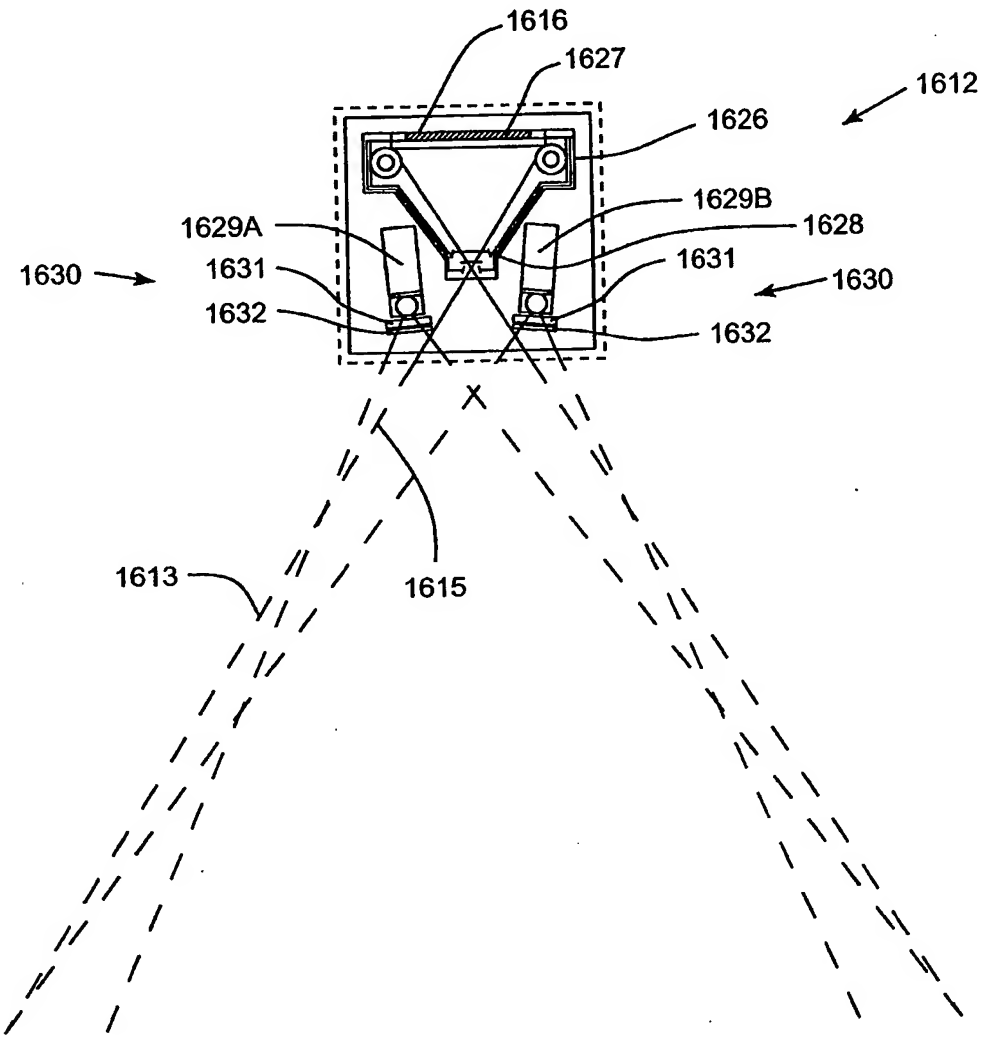
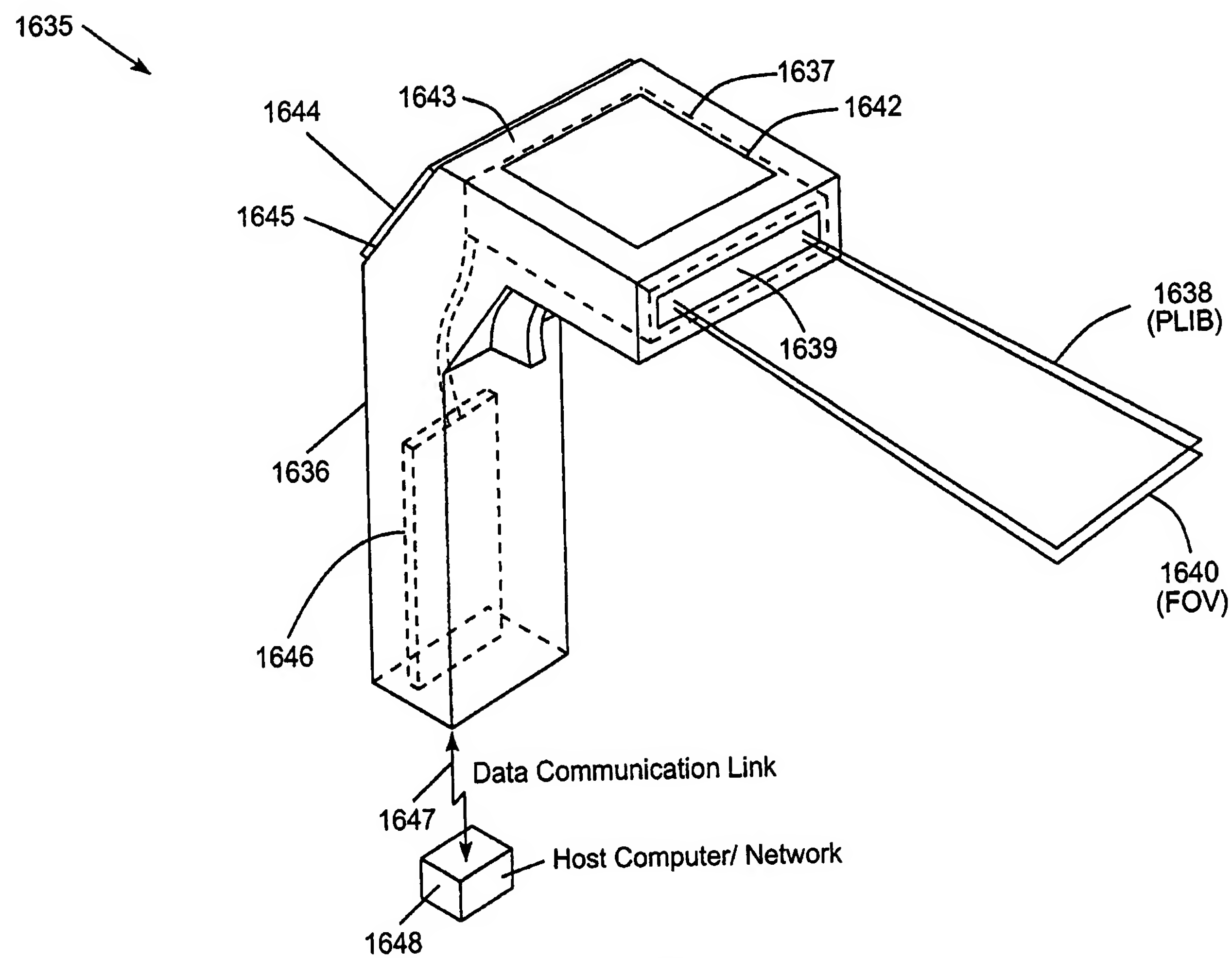

1616
1627
1612
1626
1629B
1629A
1628
1630
1631
1631
1630
1632
1632
1613
1615

FIG. 44C



1635
1644
1643
1637
1642
1645
1638
(PLIB)
1639
1636
1640
(FOV)
1646
Data Communication Link
1647
Host Computer/ Network
1648

FIG. 45A

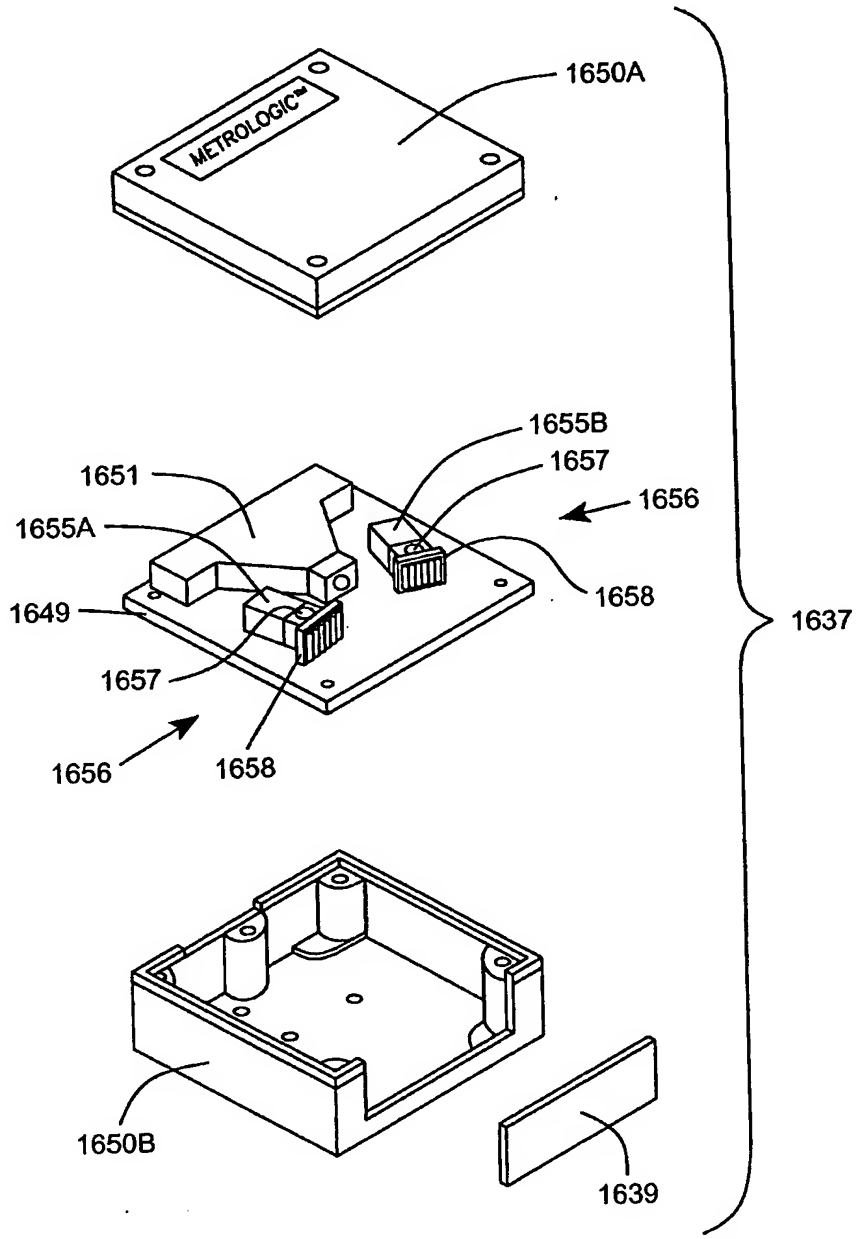

METROLOGIC
1650A
1655B
1657
1656
1651
1655A
1658
1649
1657
1656
1658
1637
1650B
1639

FIG. 45B

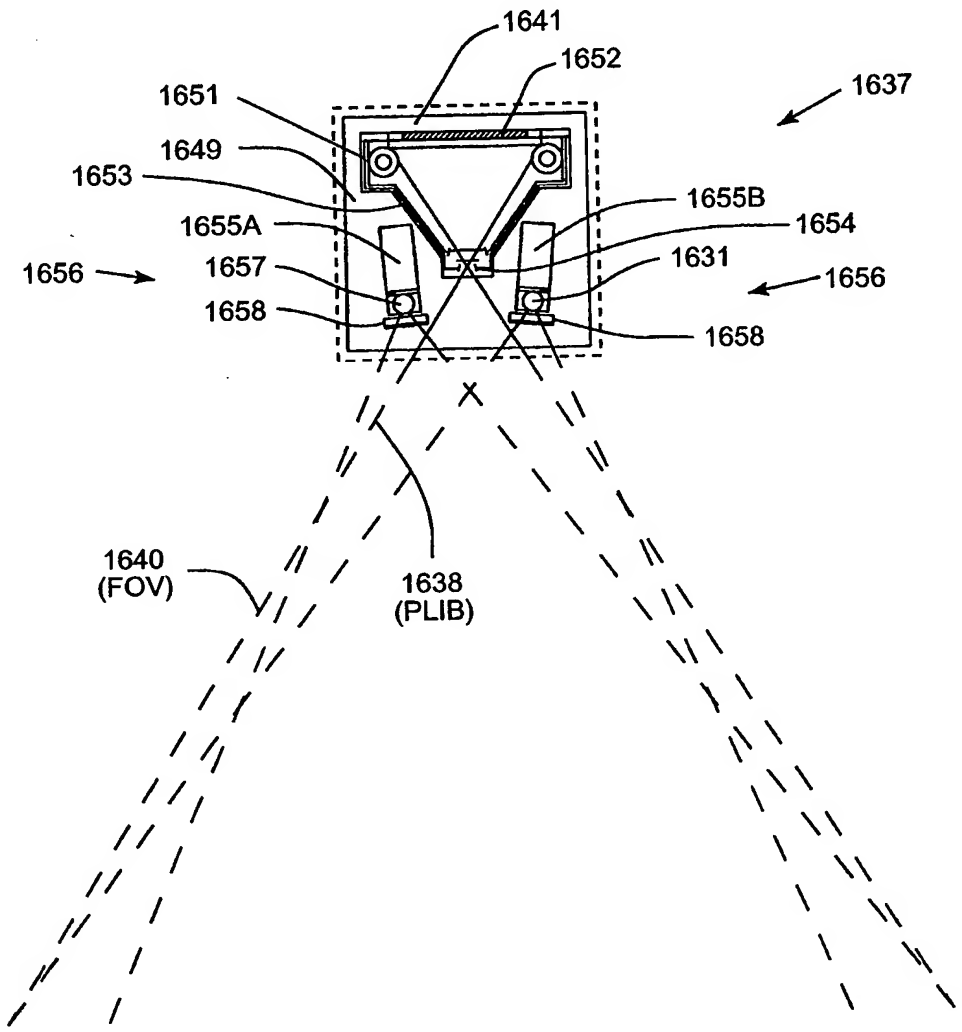

1641
1652
1637
1651
1649
1653
1655B
1655A
1654
1631
1656
1657
1656
1658
1658
1640
(FOV)
1638
(PLIB)

FIG. 45C

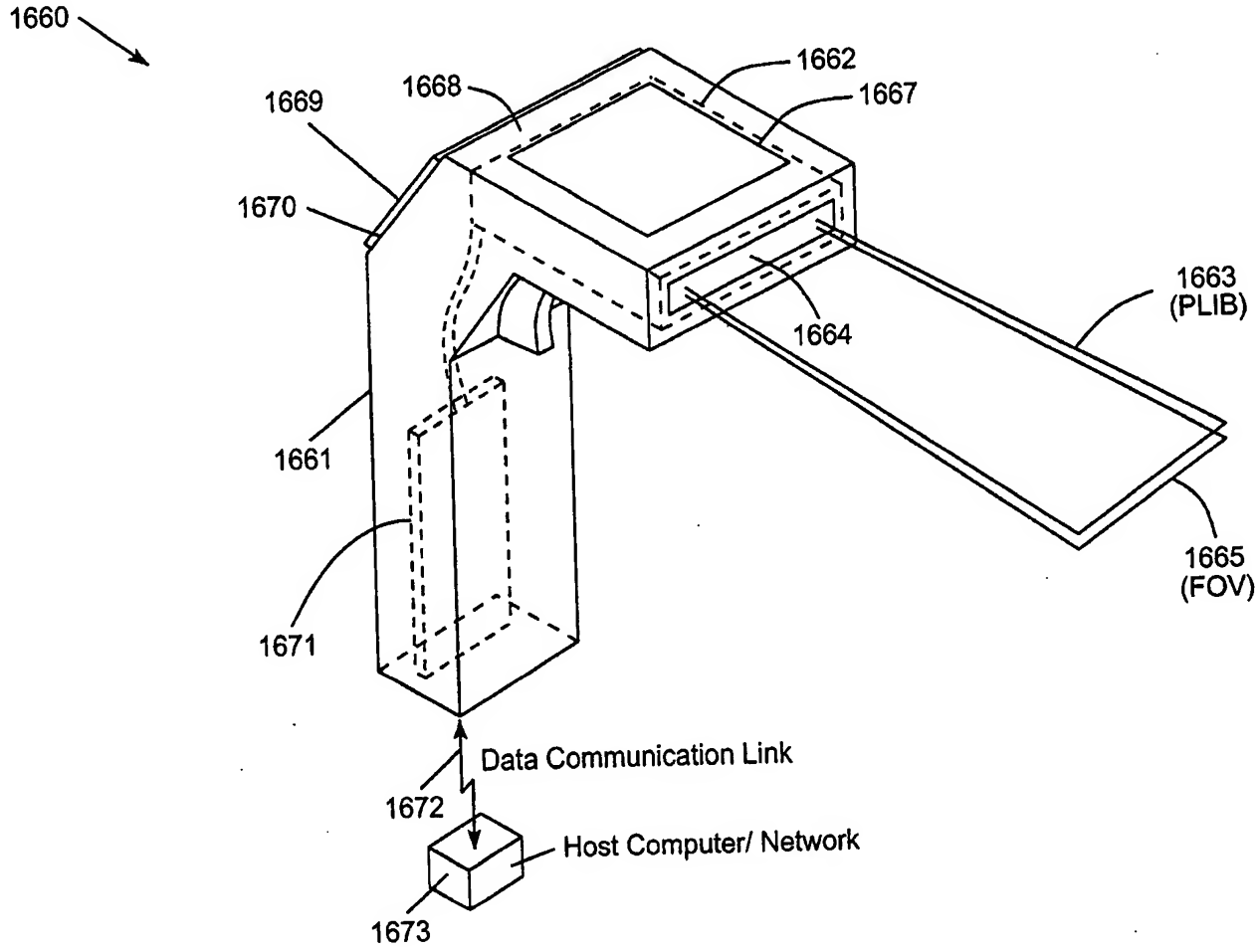

1660
1662
1668
1667
1669
1670
1663
(PLIB)
1664
1661
1665
(FOV)
1671
Data Communication Link
1672
Host Computer/ Network
1673

FIG. 46A

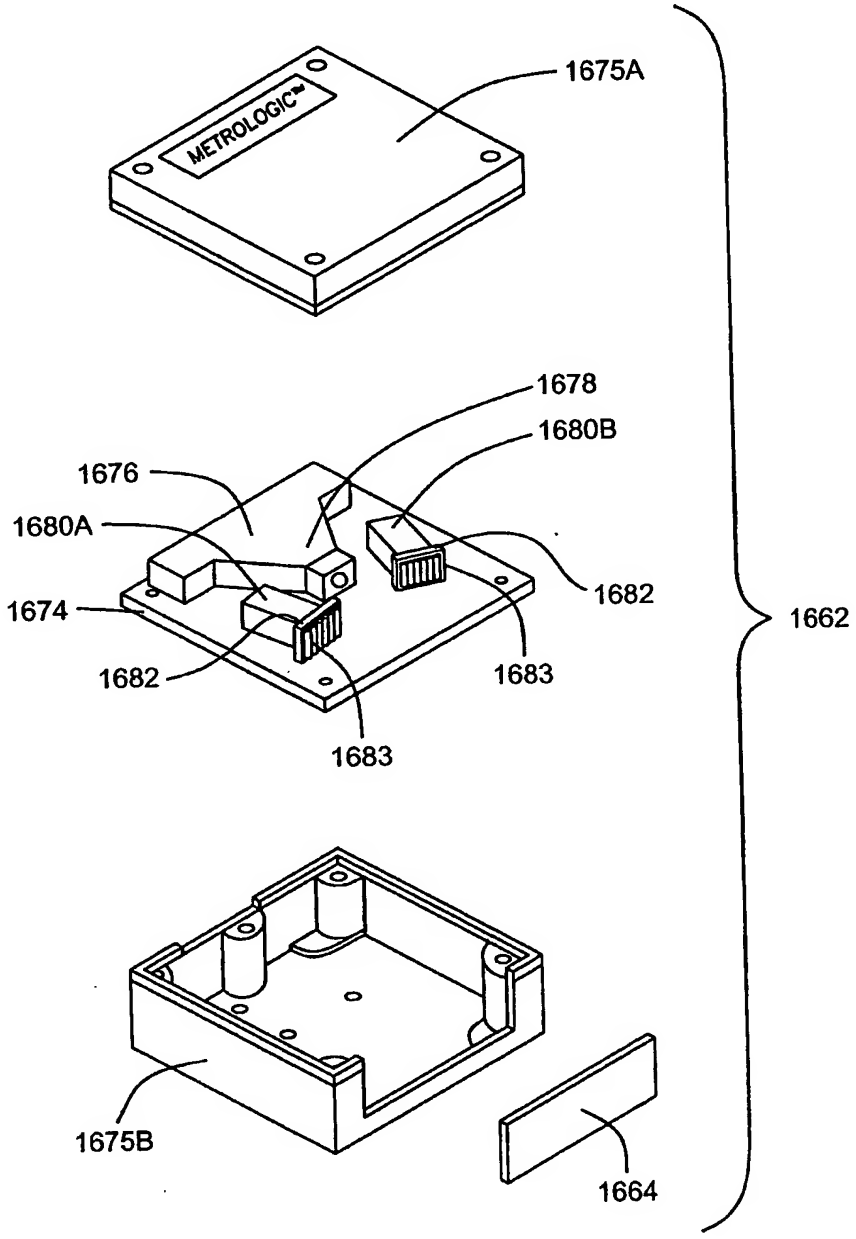

METROLOGIC
1675A
1678
1680B
1676
1680A
1682
1674
1682
1683
1683
1662
1675B
1664

FIG. 46B

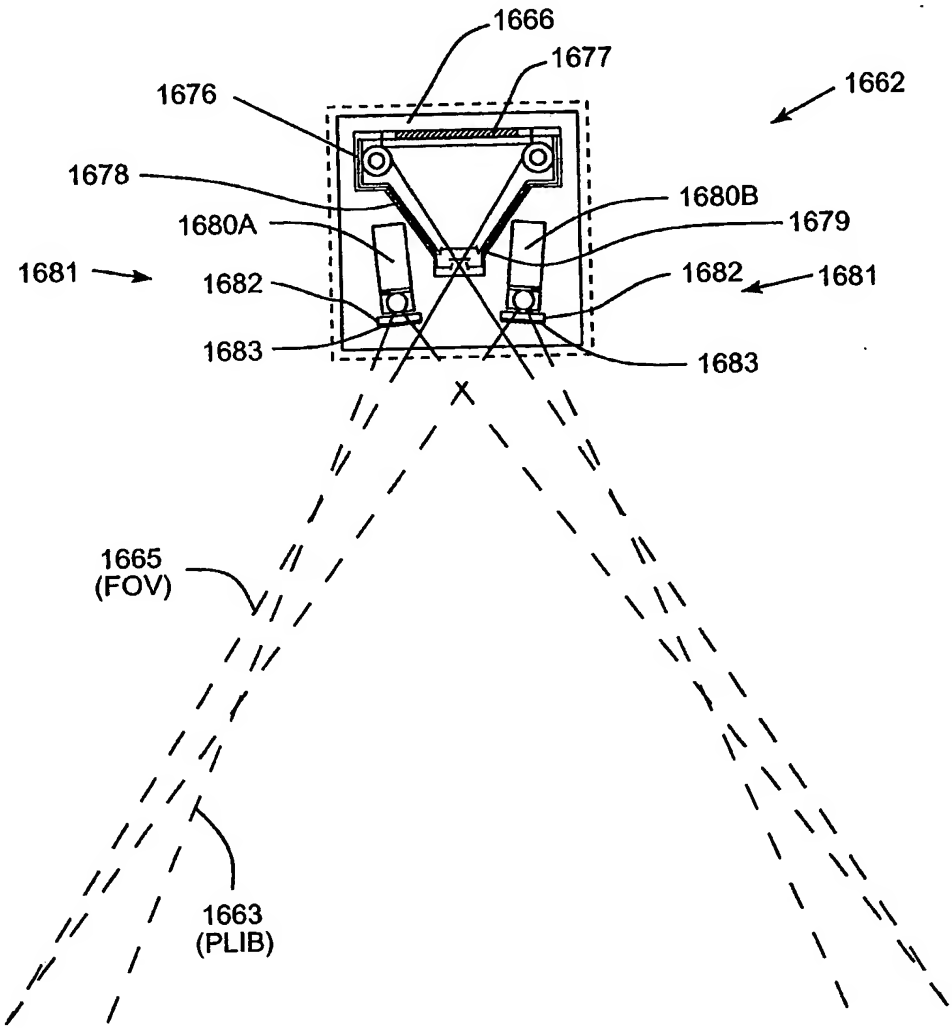

1666
1677
1676
1662
1678
1680B
1680A
1679
1681
1682
1682
1681
1683
1683
1665
(FOV)
1663
(PLIB)

FIG. 46C

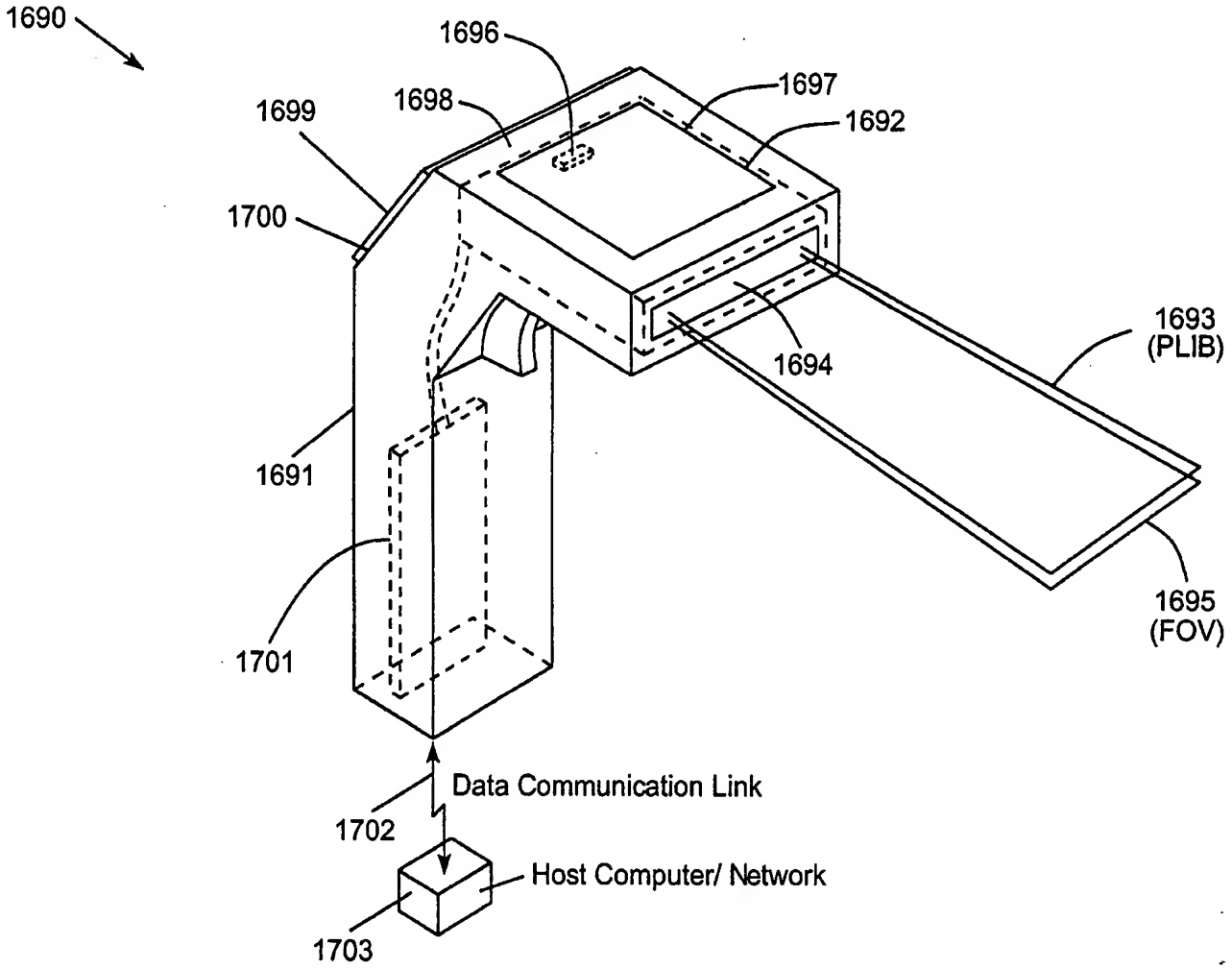


FIG. 47A

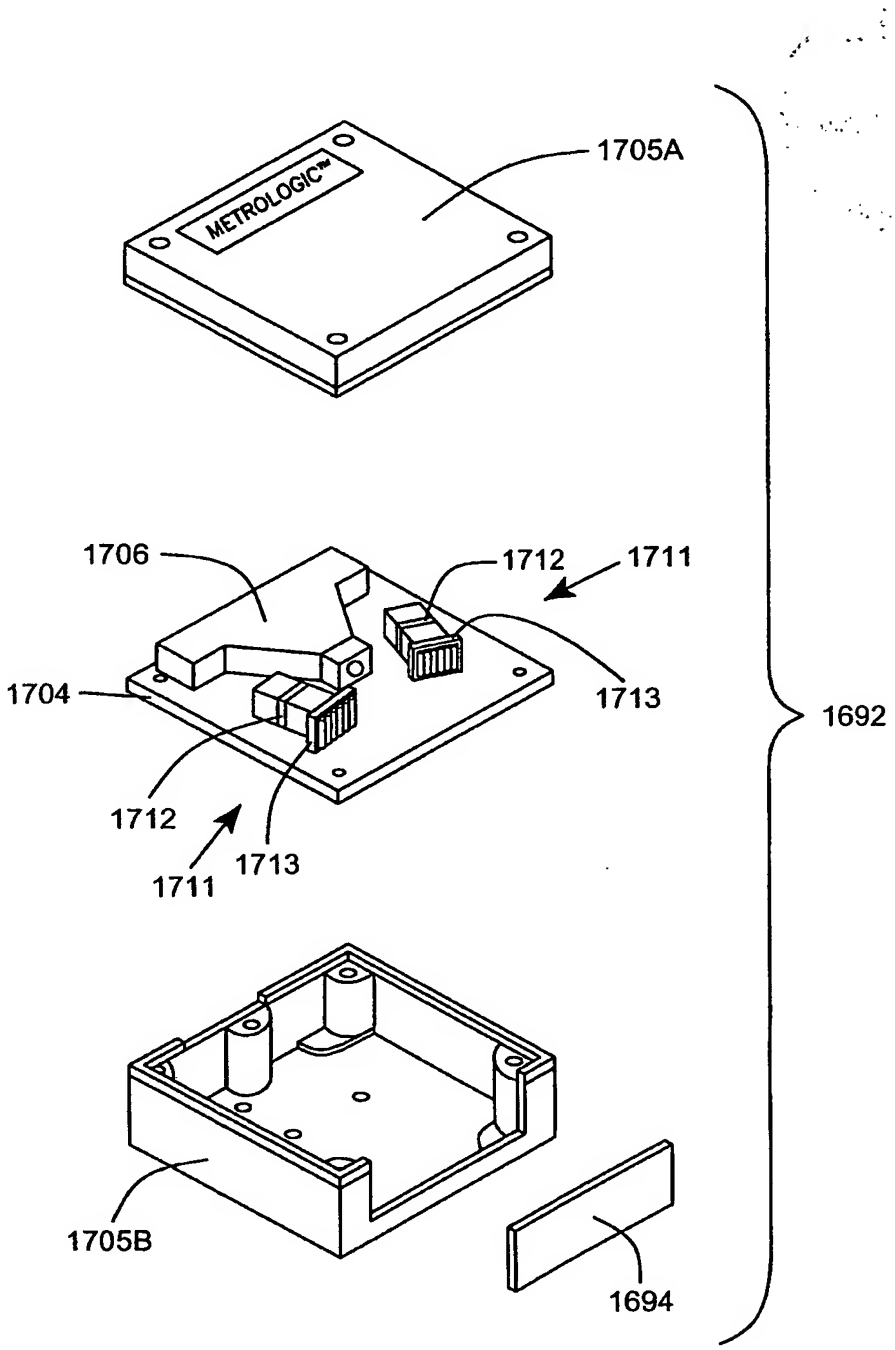

METROLOGIC™
1705A
1706
1712
1711
1704
1713
1712
1711
1713
1705B
1694
1692

FIG. 47B

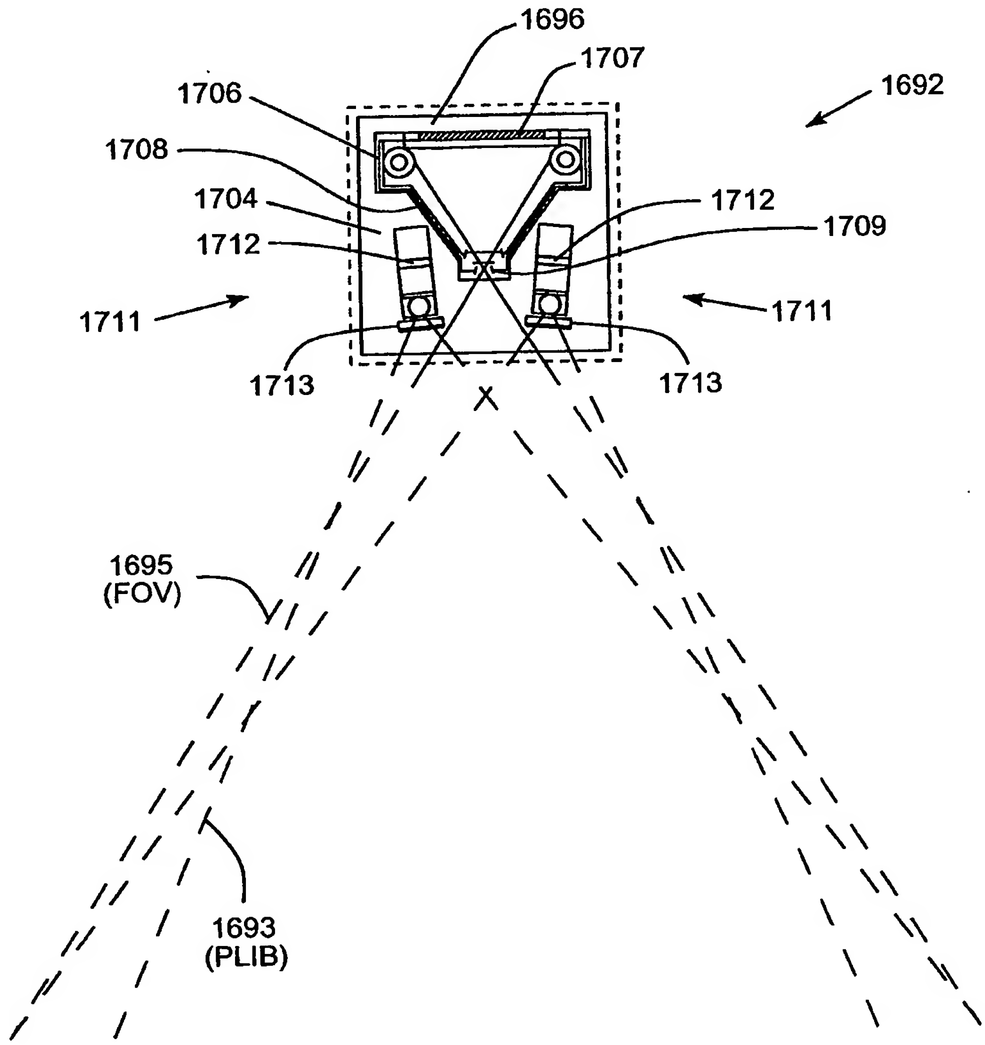


FIG. 47C

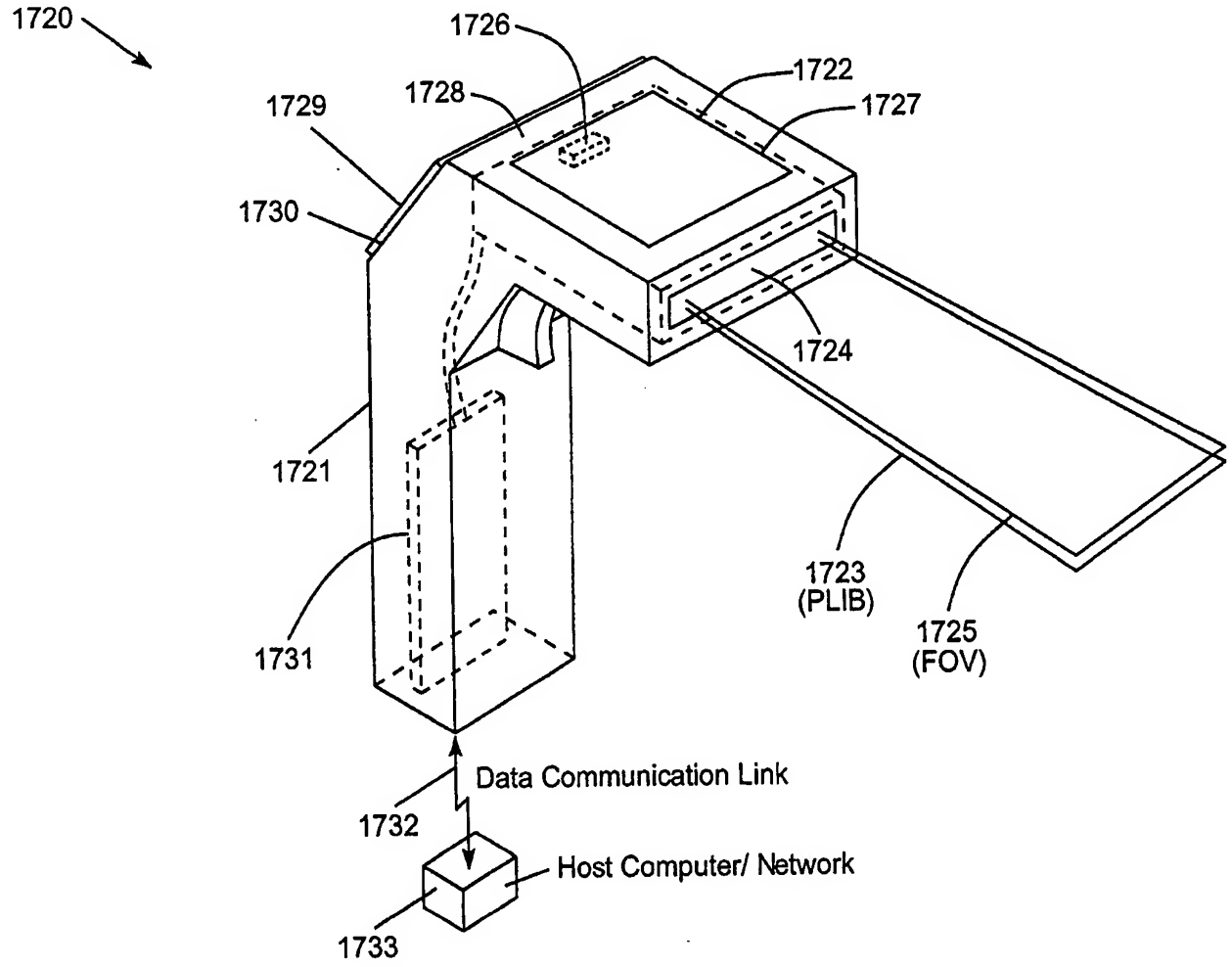


FIG. 48A

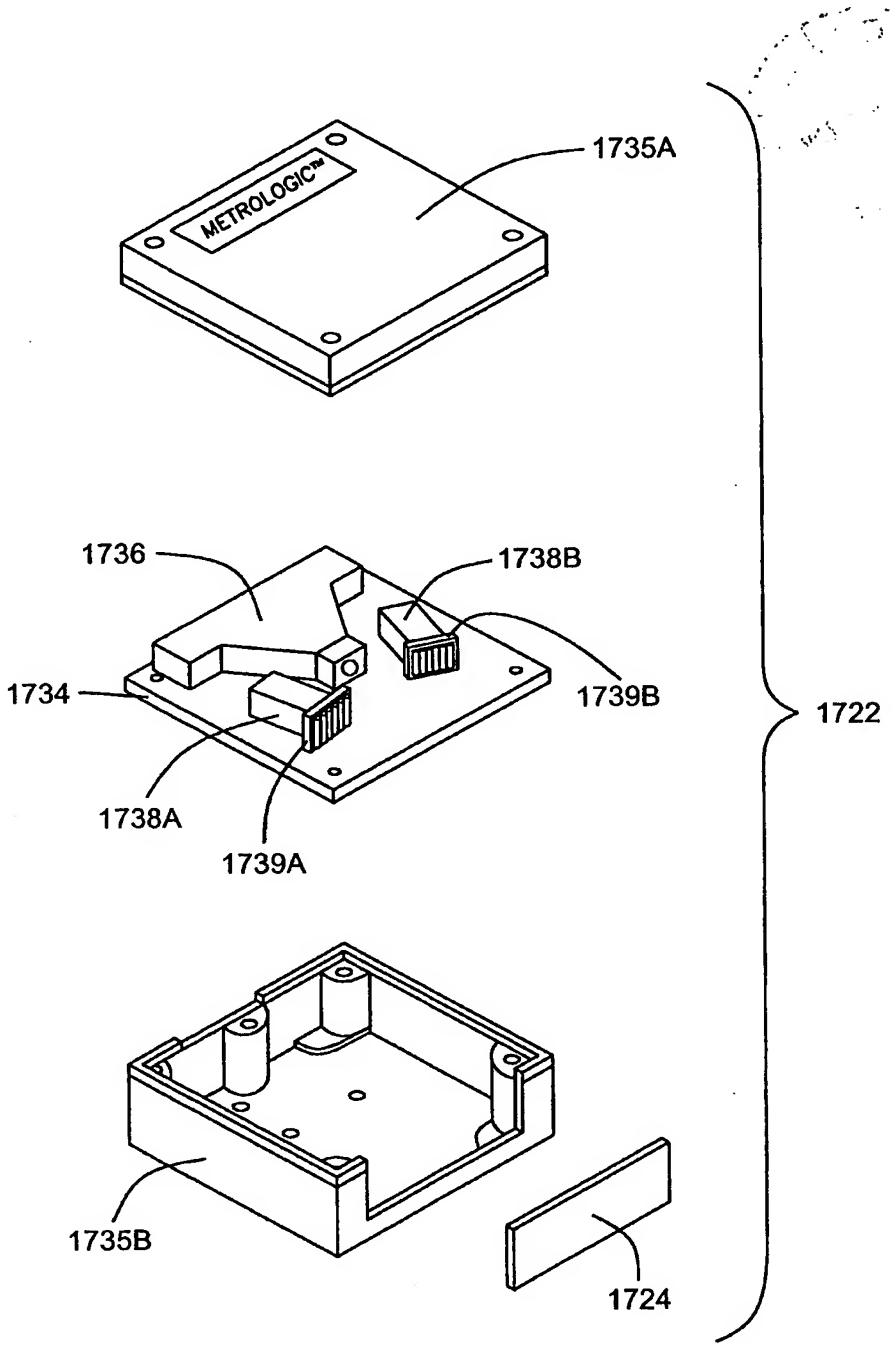

METROLOGIC™
1735A
1736
1738B
1734
1739B
1722
1738A
1739A
1735B
1724

FIG. 48B

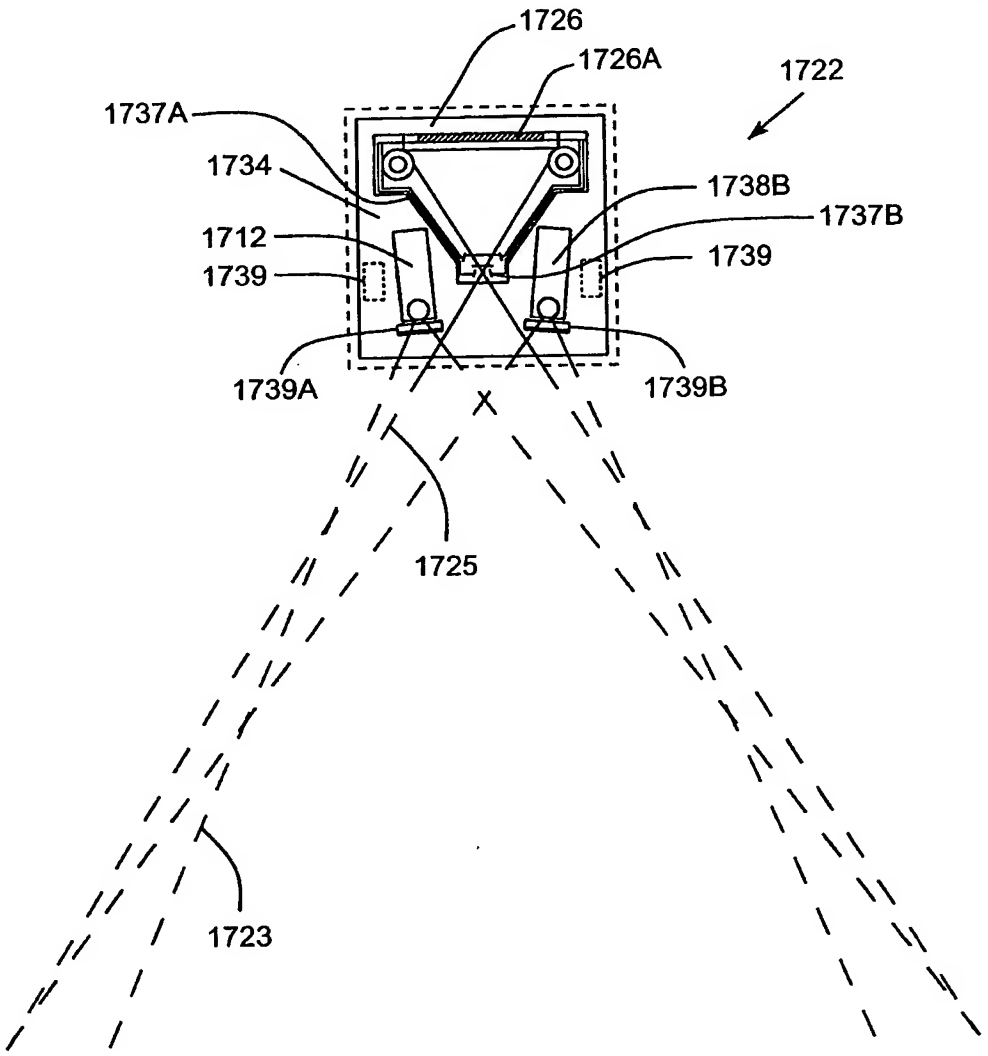

1726
1726A
1722
1737A
1734
1738B
1737B
1712
1739
1739
1739A
1739B
1725
1723

FIG. 48C

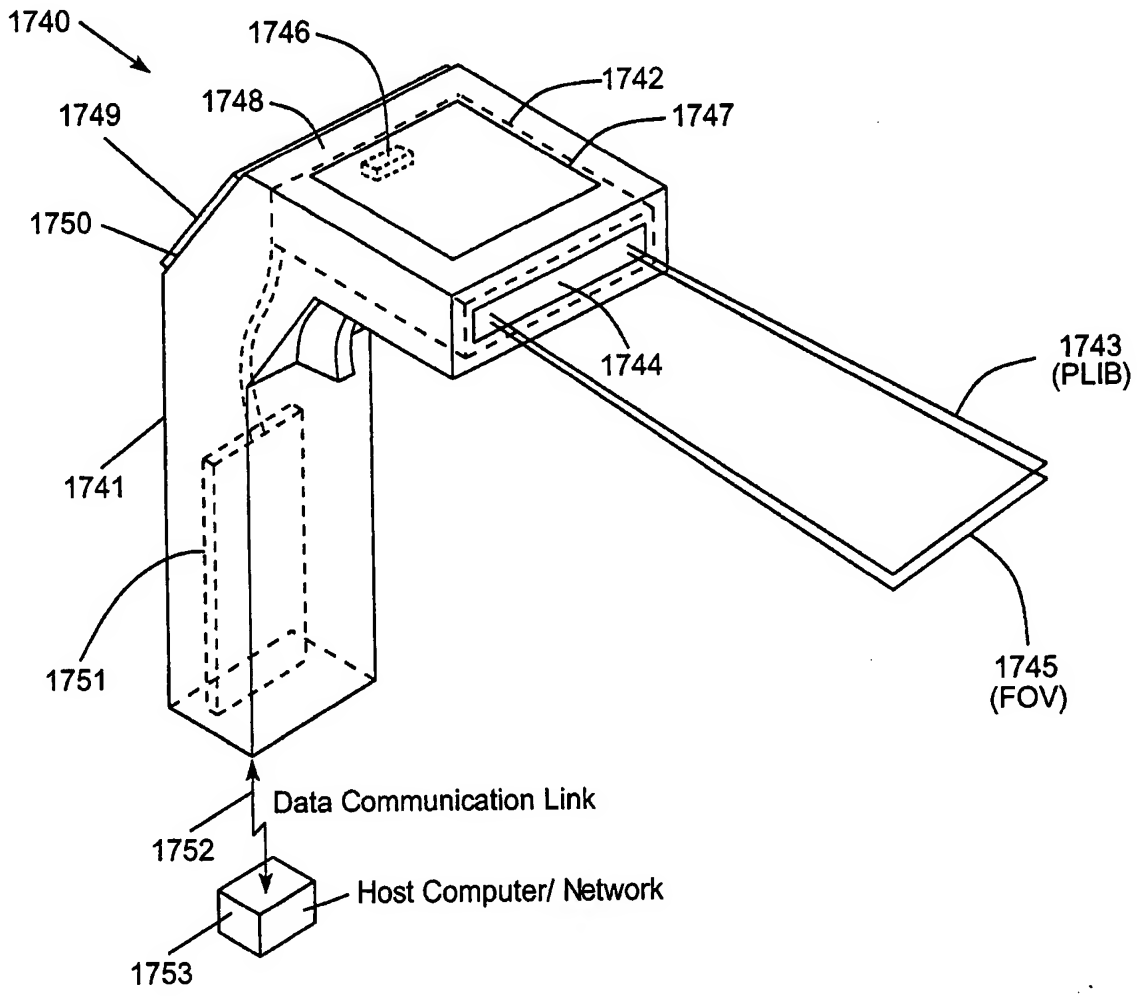


FIG. 49A

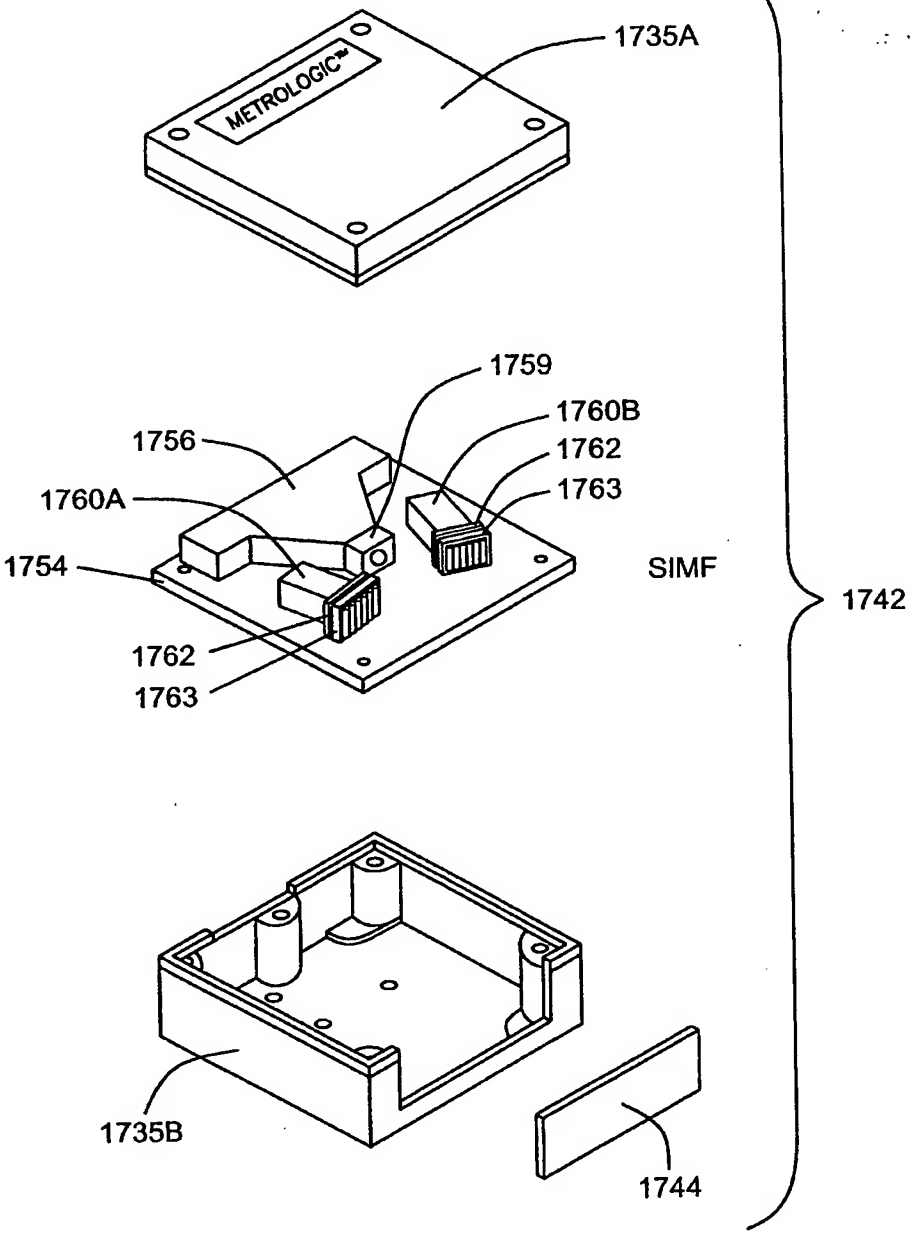

METROLOGIC™
1735A
1759
1760B
1762
1763
1756
1760A
1754
SIMF
1762
1763
1735B
1744
1742

FIG. 49B

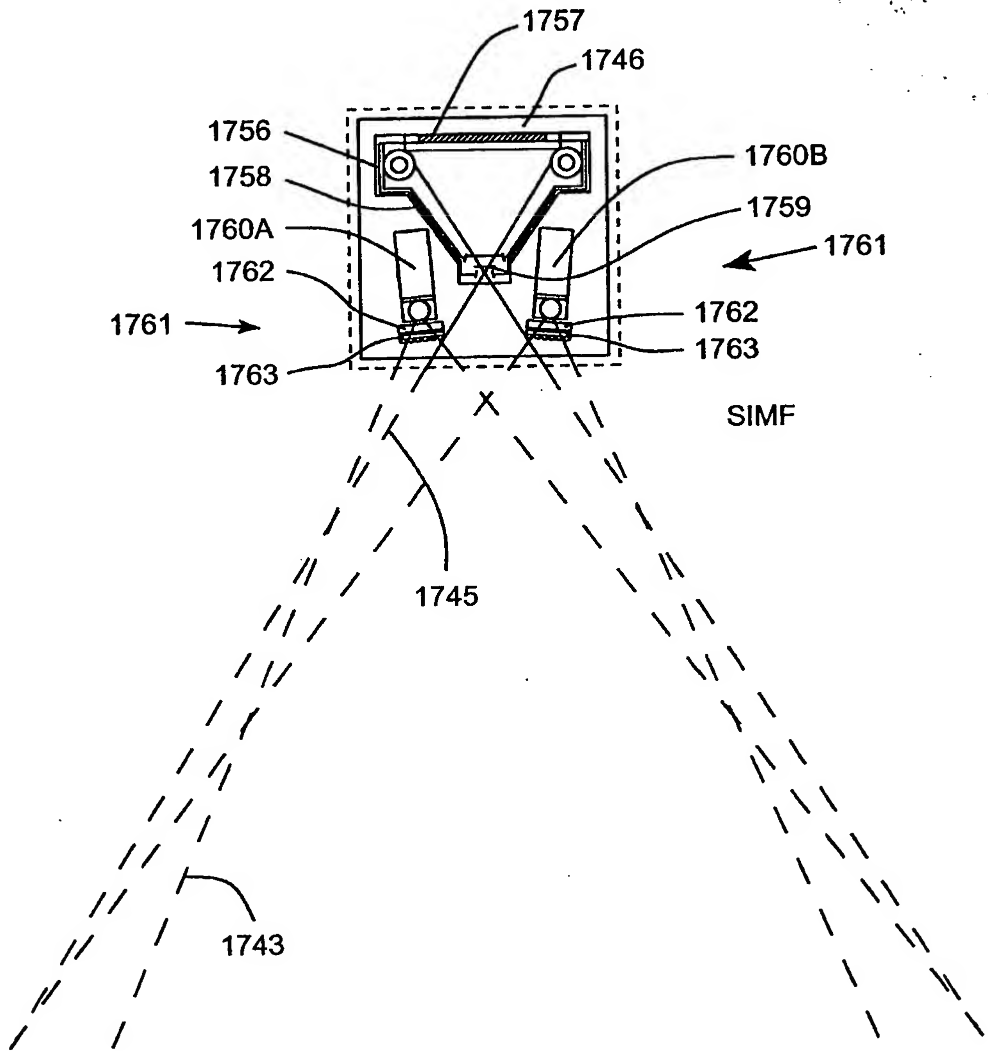

1757
1746
1756
1758
1760A
1762
1761
1763
1760B
1759
1761
1762
1763
SIMF
1745
1743

FIG. 49C

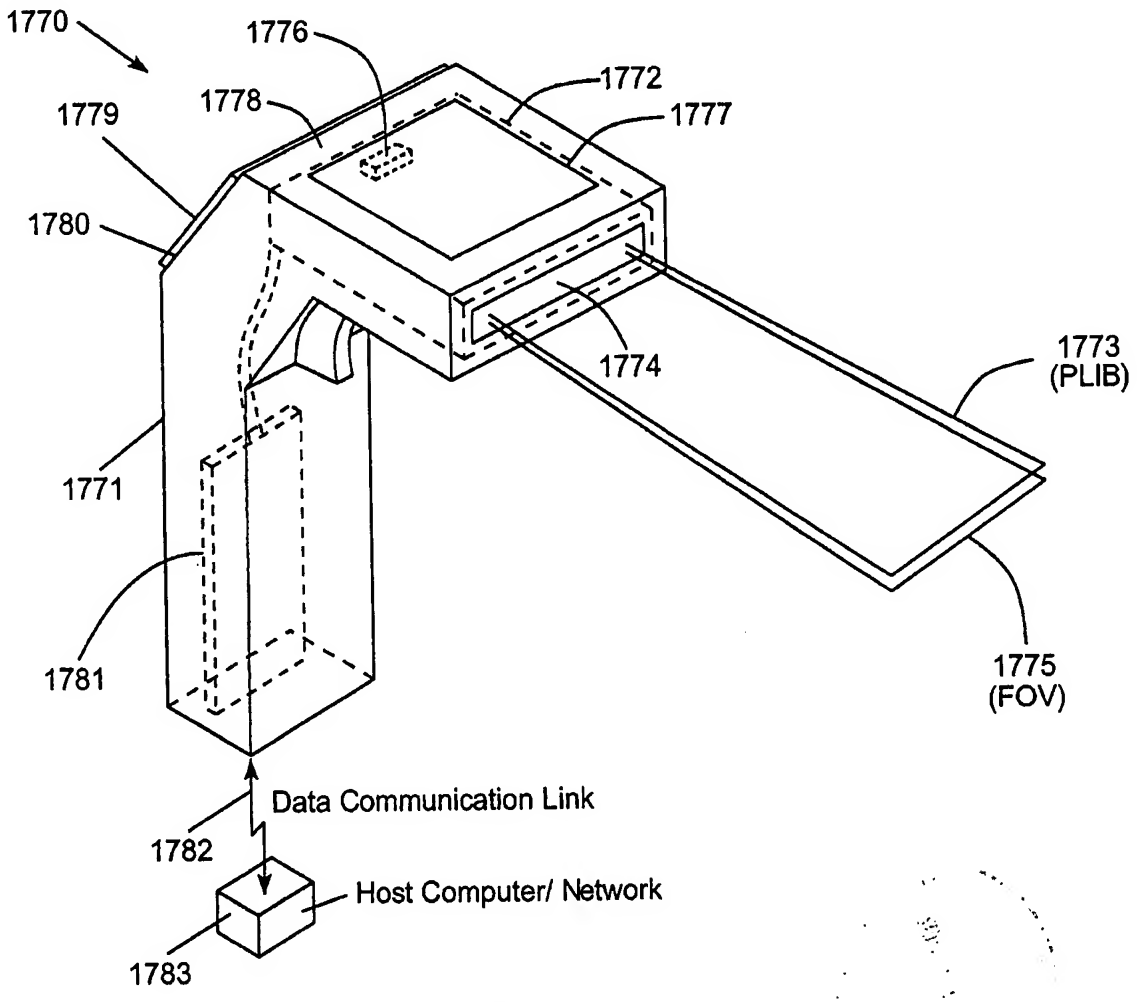


FIG. 50A

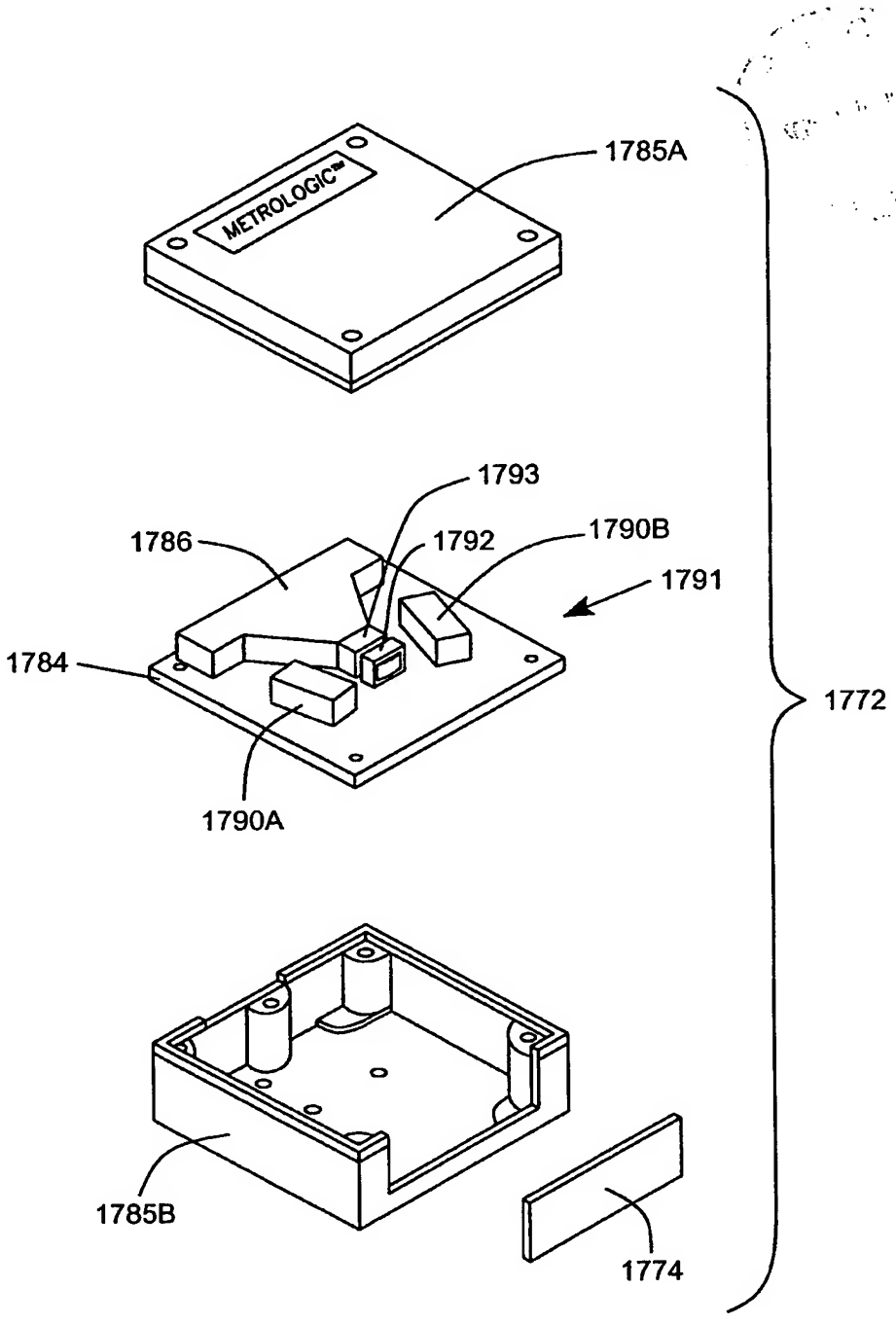

METROLOGIC
1785A
1793
1786
1792
1790B
1791
1784
1790A
1772
1785B
1774

FIG. 50B

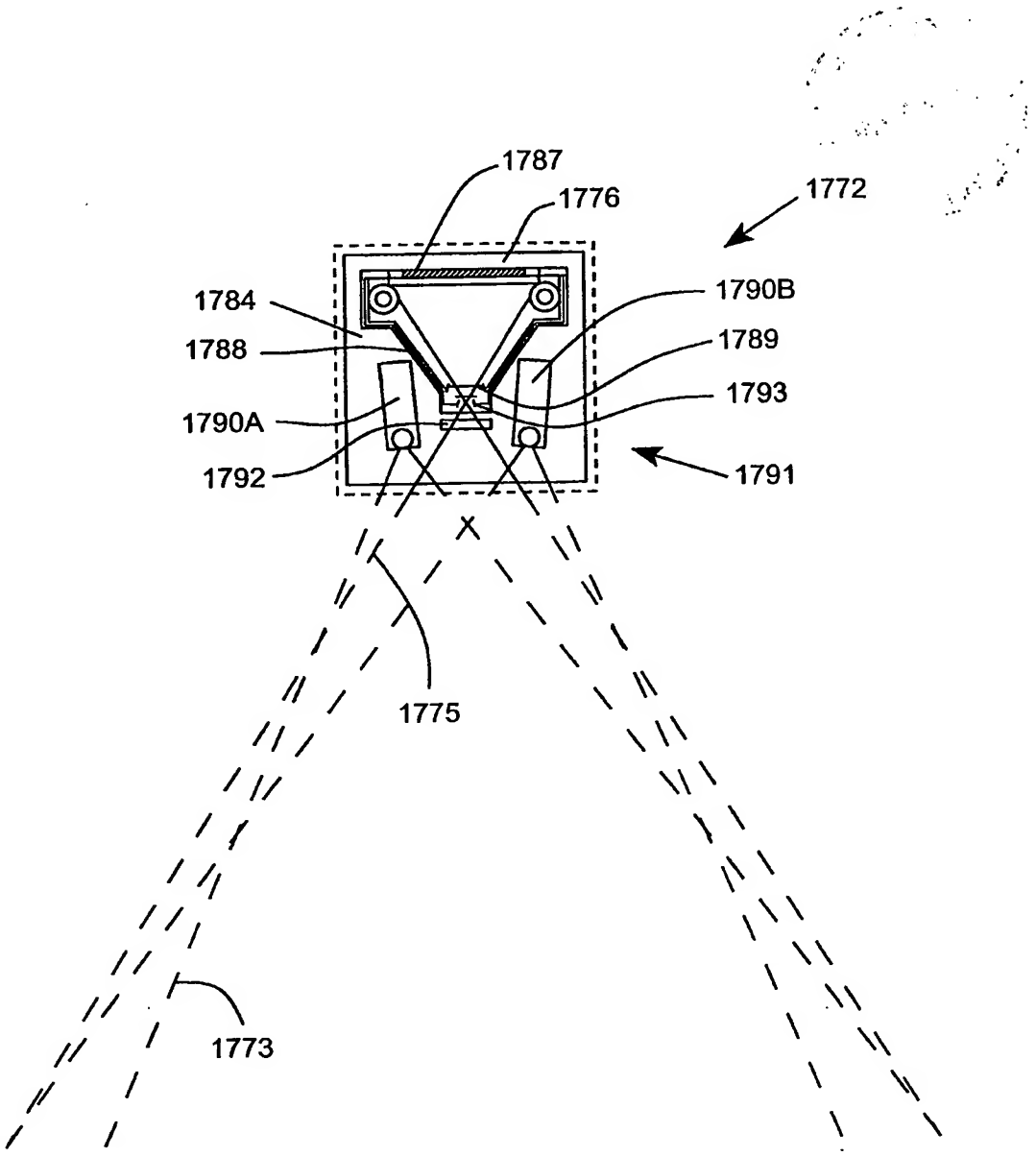

1787
1776
1772
1784
1790B
1788
1789
1793
1790A
1792
1791
1775
1773

FIG. 50C

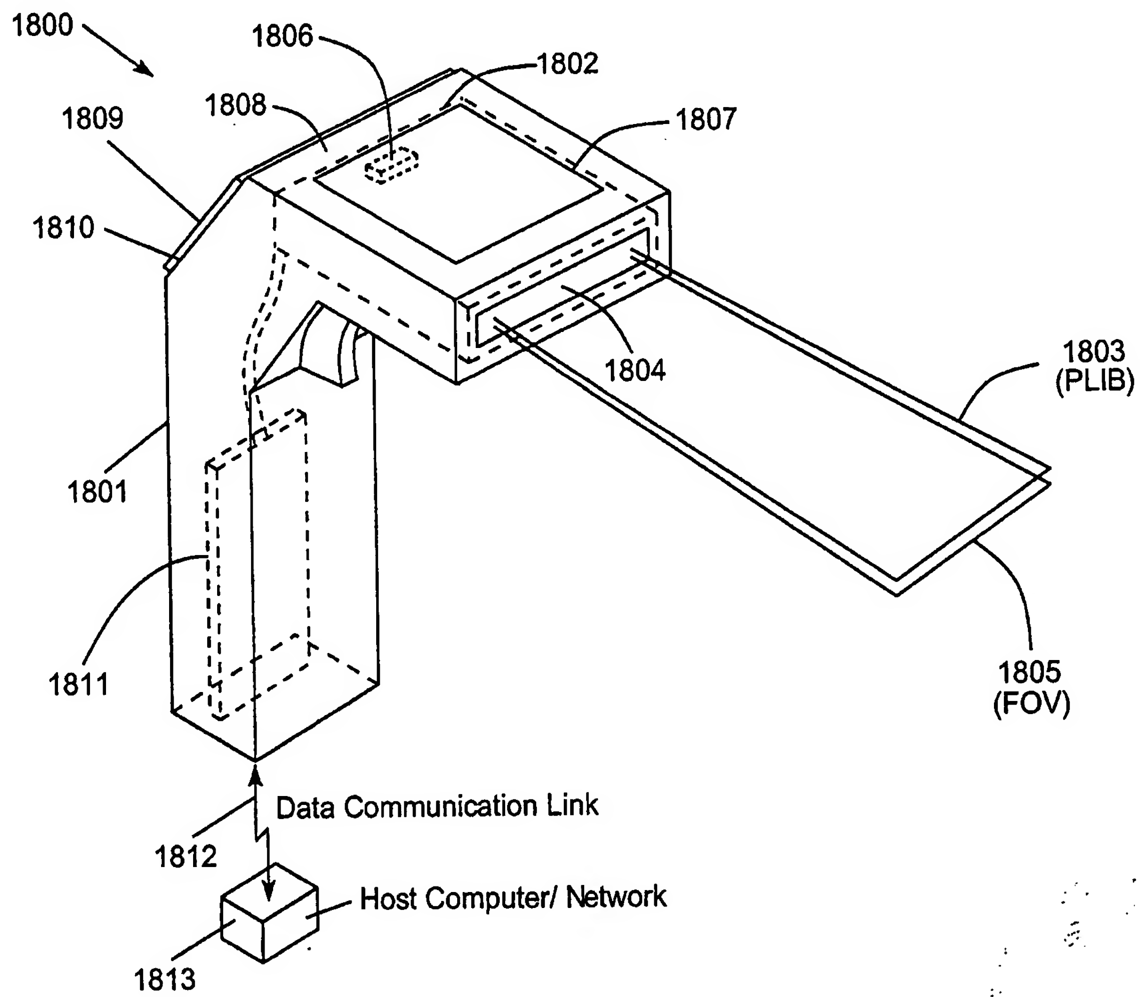

1800
1806
1802
1808
1809
1807
1810
1804
1803
(PLIB)
1801
1811
1805
(FOV)
Data Communication Link
1812
Host Computer/ Network
1813

FIG. 51A

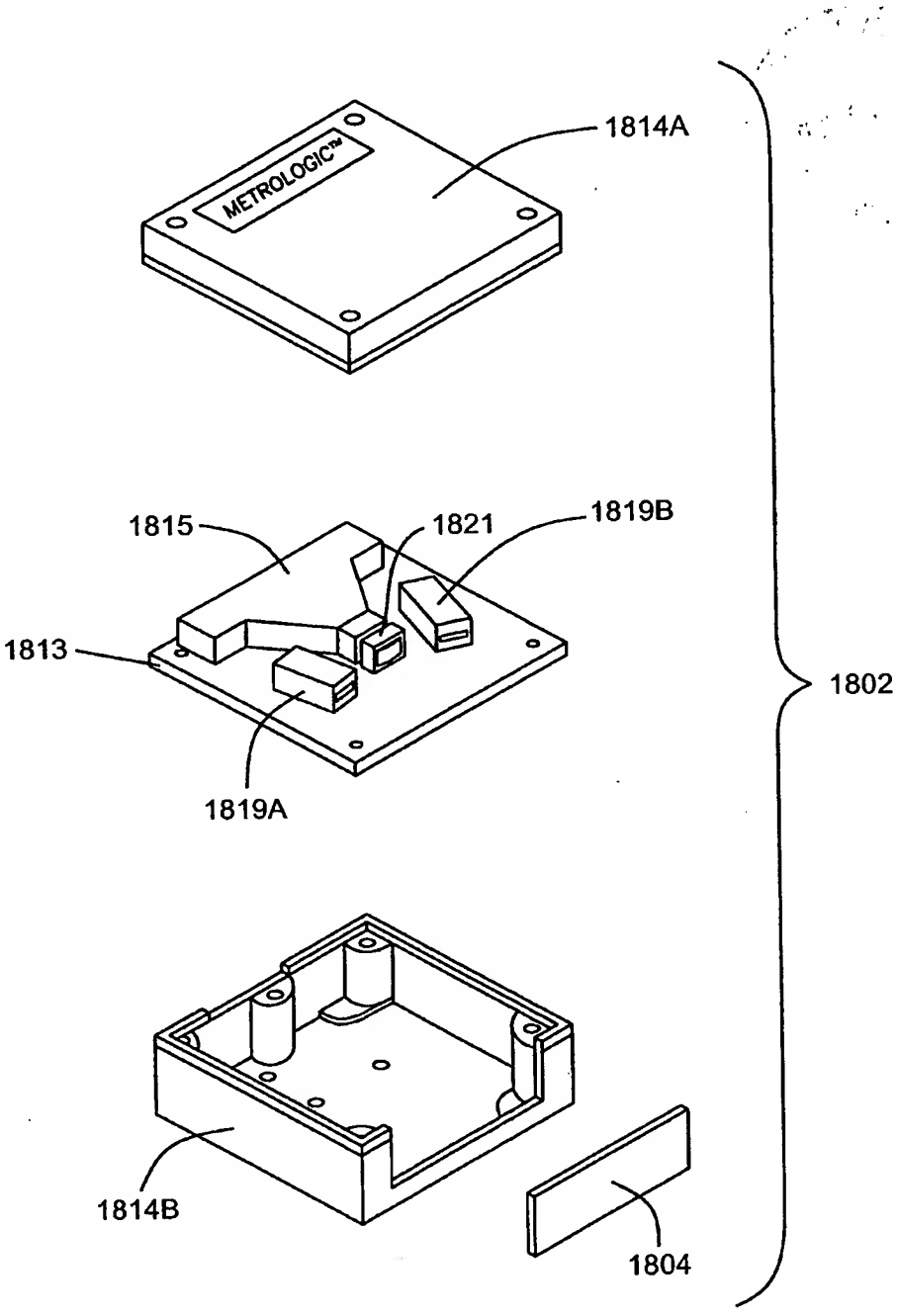

METROLOGIC™
1814A
1815
1821
1819B
1813
1819A
1814B
1804
1802

FIG. 51B

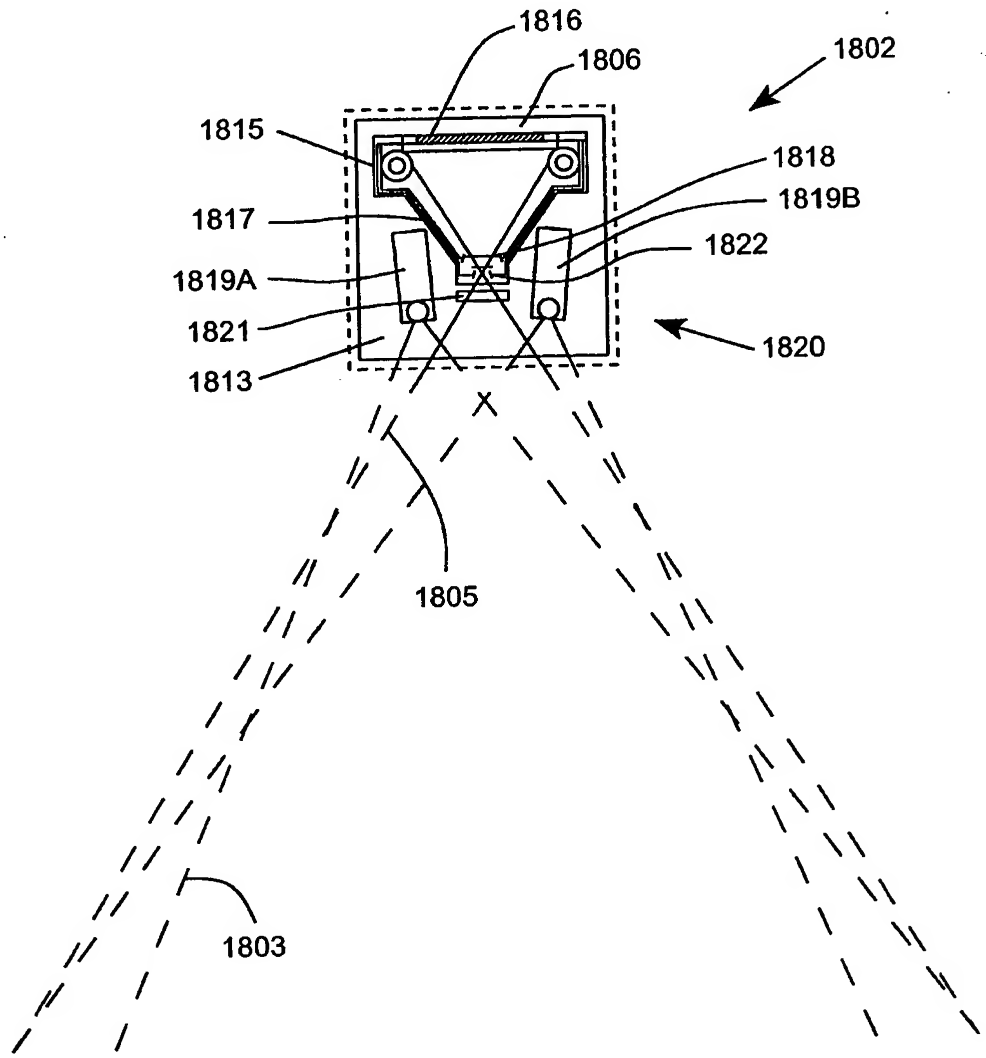

1816
1806
1802
1815
1818
1819B
1817
1822
1819A
1821
1820
1813
1805
1803

FIG. 51C

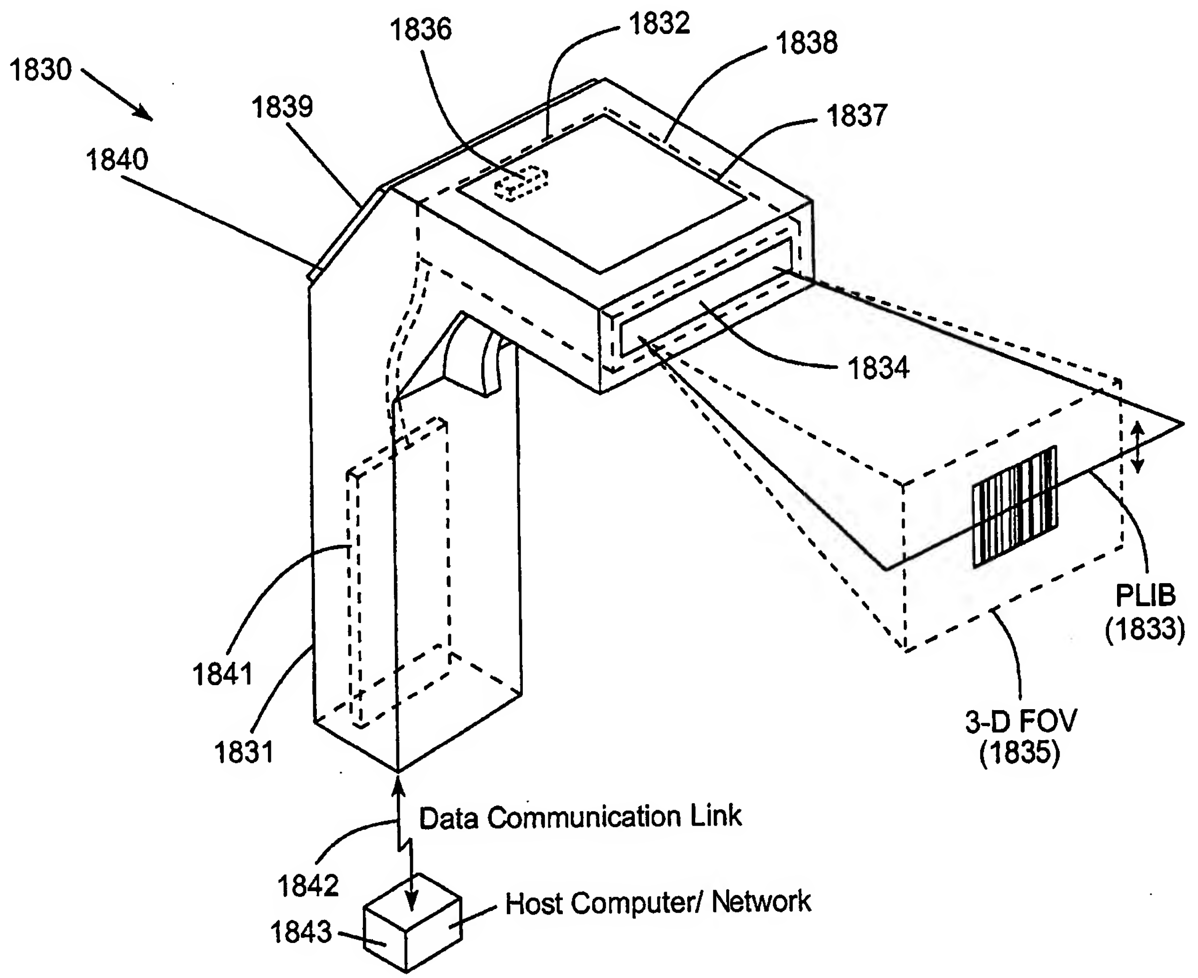

1830
1836
1832
1838
1837
1839
1840
1834
1841
1831
PLIB
(1833)
3-D FOV
(1835)
Data Communication Link
1842
1843
Host Computer/ Network

FIG. 52A

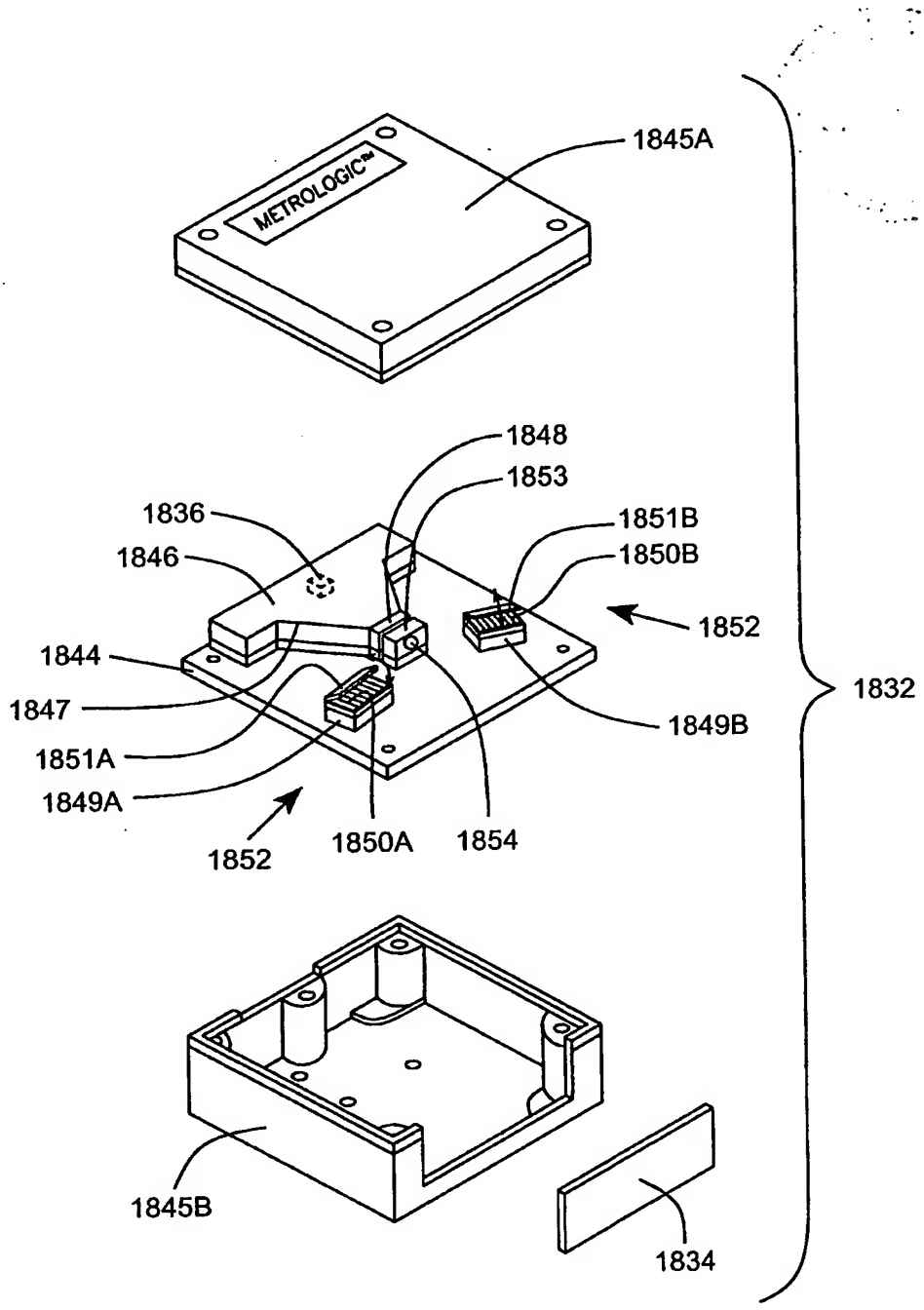


Fig. 1I3A-3B

FIG. 52B

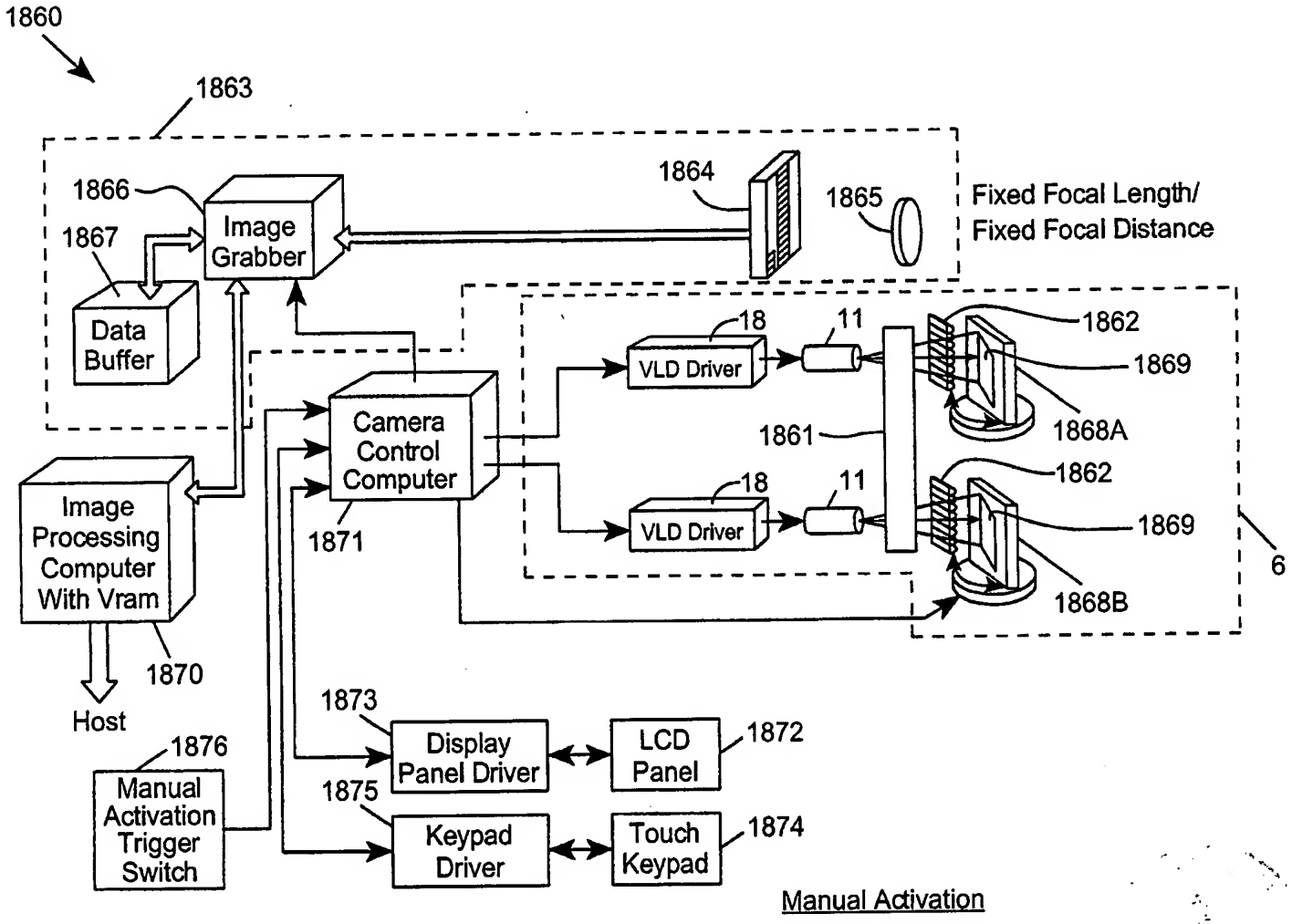

1860
1863
1866
1867
Image Grabber
1864
1865
Fixed Focal Length/
Fixed Focal Distance
Data Buffer
18
11
1862
VLD Driver
1869
1868A
1861
Camera Control Computer
18
11
1862
VLD Driver
1869
1871
6
Image Processing Computer With Vram
1868B
1870
Host
1873
1876
Display Panel Driver
LCD Panel
1872
1875
Manual Activation Trigger Switch
Keypad Driver
Touch Keypad
1874
Manual Activation

FIG. 53A1

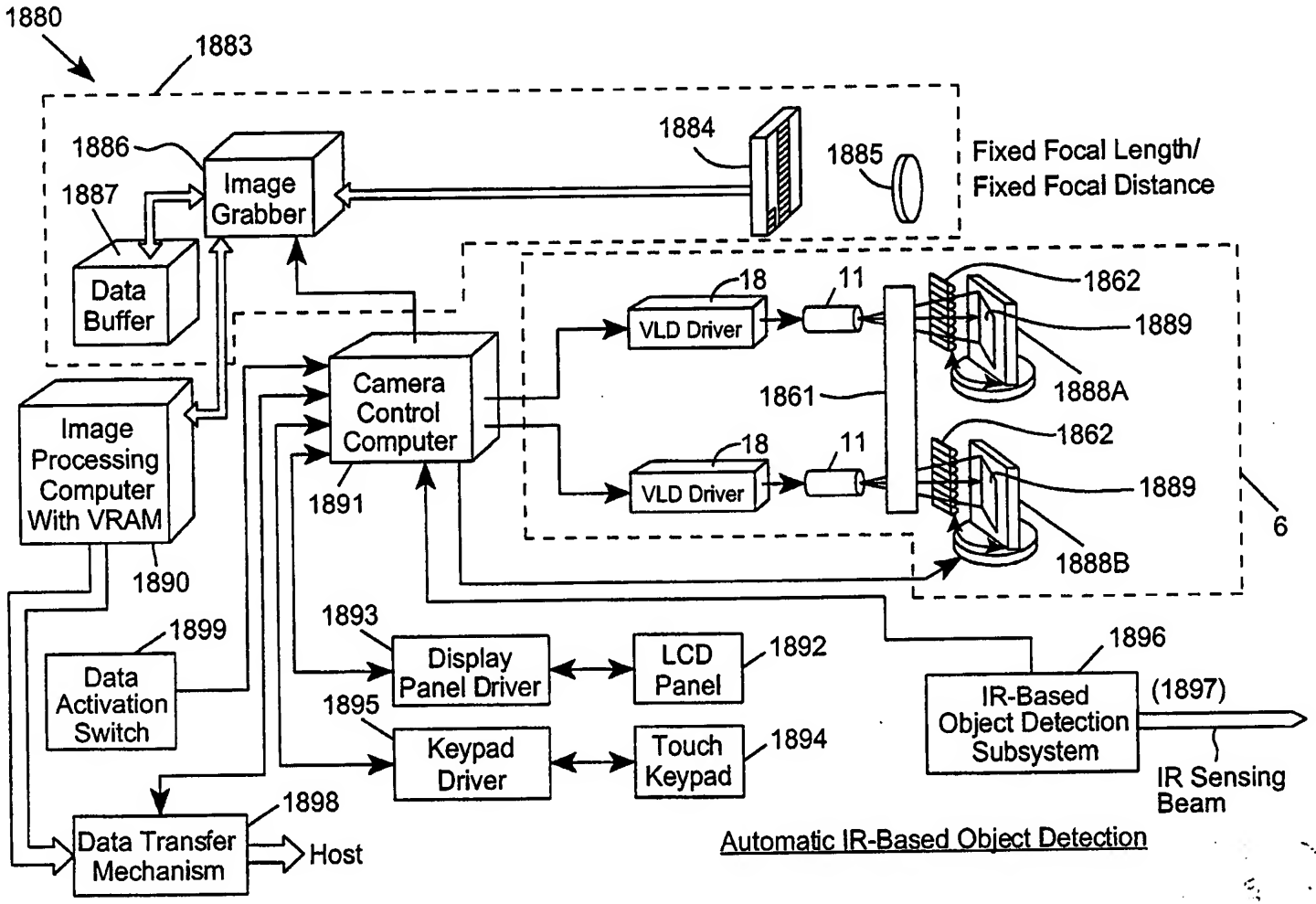

1880
1883
1884
1885
Fixed Focal Length/
Fixed Focal Distance
1886
Image
Grabber
1887
Data
Buffer
18
11
1862
VLD Driver
1889
1888A
1861
Camera
Control
Computer
Image
Processing
Computer
With VRAM
1891
1890
1862
1889
1888B
6
1893
1899
Display
Panel Driver
LCD
Panel
1892
1896
Data
Activation
Switch
1895
Keypad
Driver
Touch
Keypad
1894
IR-Based
Object Detection
Subsystem
(1897)
IR Sensing
Beam
1898
Data Transfer
Mechanism
Host
Automatic IR-Based Object Detection

FIG. 53A2

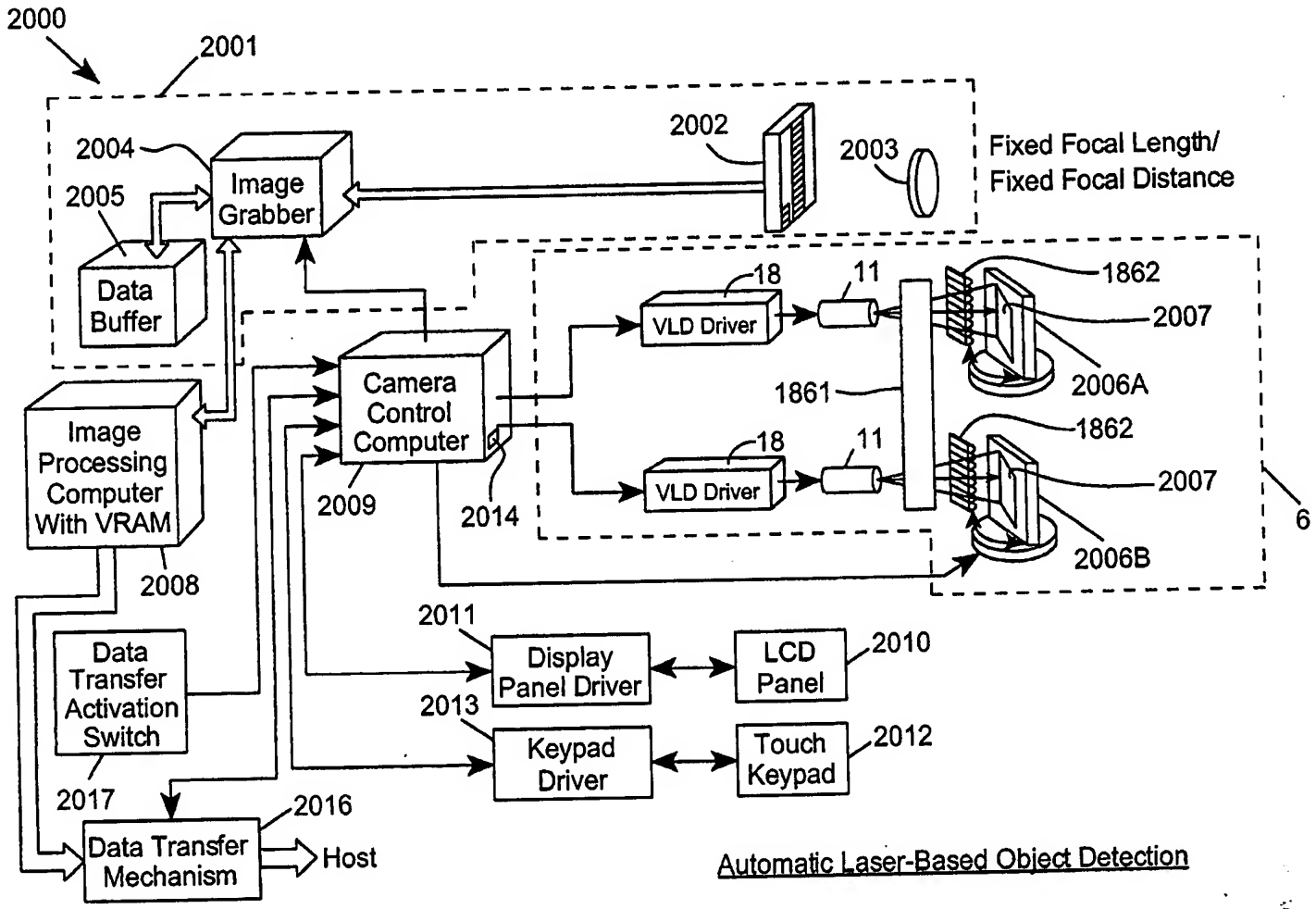

2000
2001
2002
2003
Fixed Focal Length/
Fixed Focal Distance
2004
Image
Grabber
2005
Data
Buffer
18
11
1862
VLD Driver
2007
2006A
1861
Camera
Control
Computer
Image
Processing
Computer
With VRAM
2009
2014
18
11
1862
VLD Driver
2007
6
2006B
2008
2011
Display
Panel Driver
LCD
Panel
2010
Data
Transfer
Activation
Switch
2013
Keypad
Driver
Touch
Keypad
2012
2017
2016
Data Transfer
Mechanism
Host
Automatic Laser-Based Object Detection

FIG. 53A3

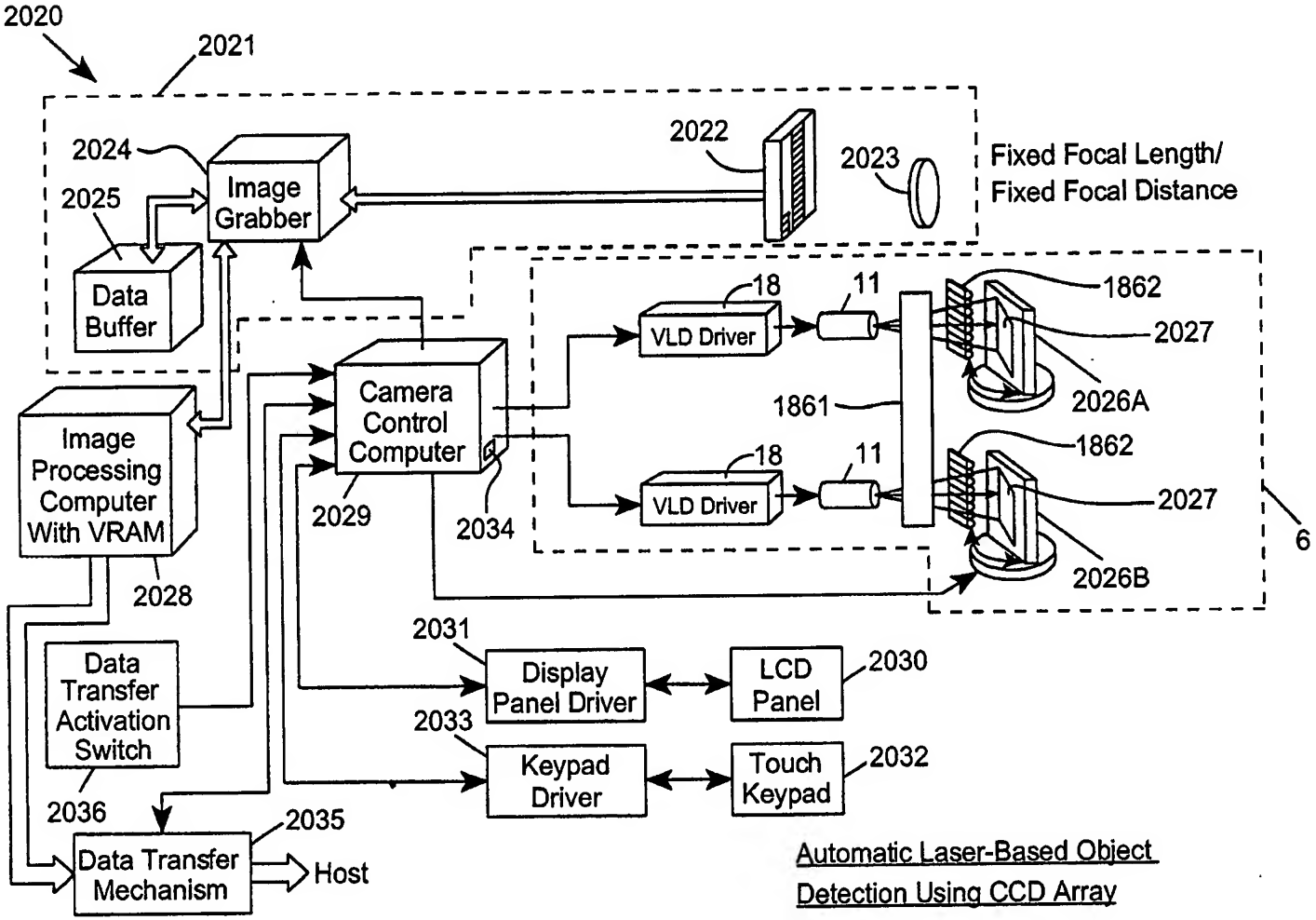

2020
2021
2024
Image Grabber
2025
Data Buffer
2022
2023
Fixed Focal Length/
Fixed Focal Distance
18
11
VLD Driver
1862
2027
2026A
1861
18
11
VLD Driver
1862
2027
2026B
6
Camera Control Computer
2029
2034
Image Processing Computer With VRAM
2028
2031
Display Panel Driver
LCD Panel
2030
2033
Keypad Driver
Touch Keypad
2032
Data Transfer Activation Switch
2036
2035
Data Transfer Mechanism
Host
Automatic Laser-Based Object
Detection Using CCD Array

FIG. 53A4

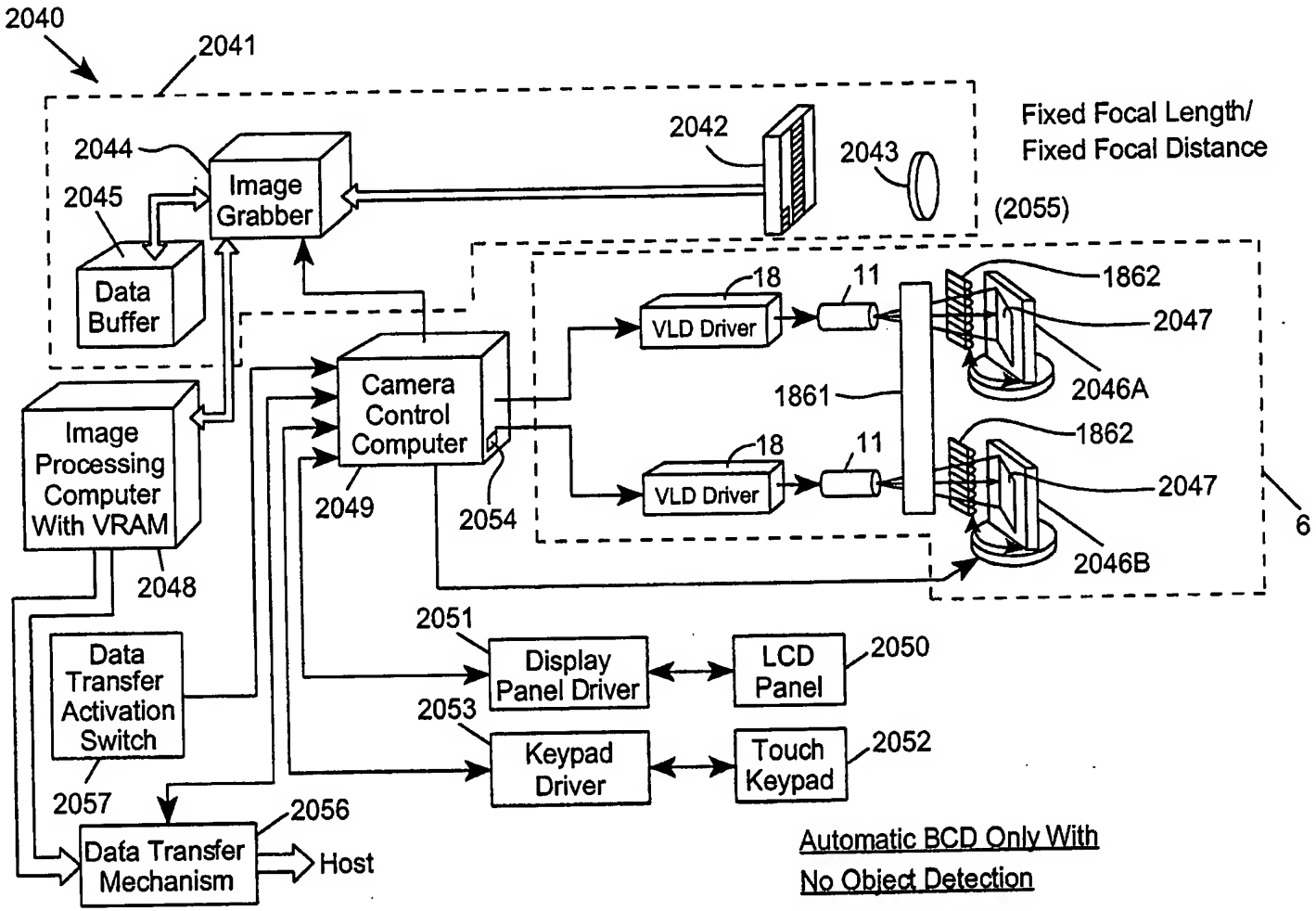

2040
2041
2042
2043
Fixed Focal Length/
Fixed Focal Distance
(2055)
2044
Image
Grabber
2045
Data
Buffer
18
11
1862
VLD Driver
2047
2046A
1861
Camera
Control
Computer
Image
Processing
Computer
With VRAM
2049
2054
18
11
1862
VLD Driver
2047
2046B
6
2048
2051
Data
Transfer
Activation
Switch
Display
Panel Driver
LCD
Panel
2050
2053
Keypad
Driver
Touch
Keypad
2052
2057
2056
Data Transfer
Mechanism
Host
Automatic BCD Only With
No Object Detection

FIG. 53A5

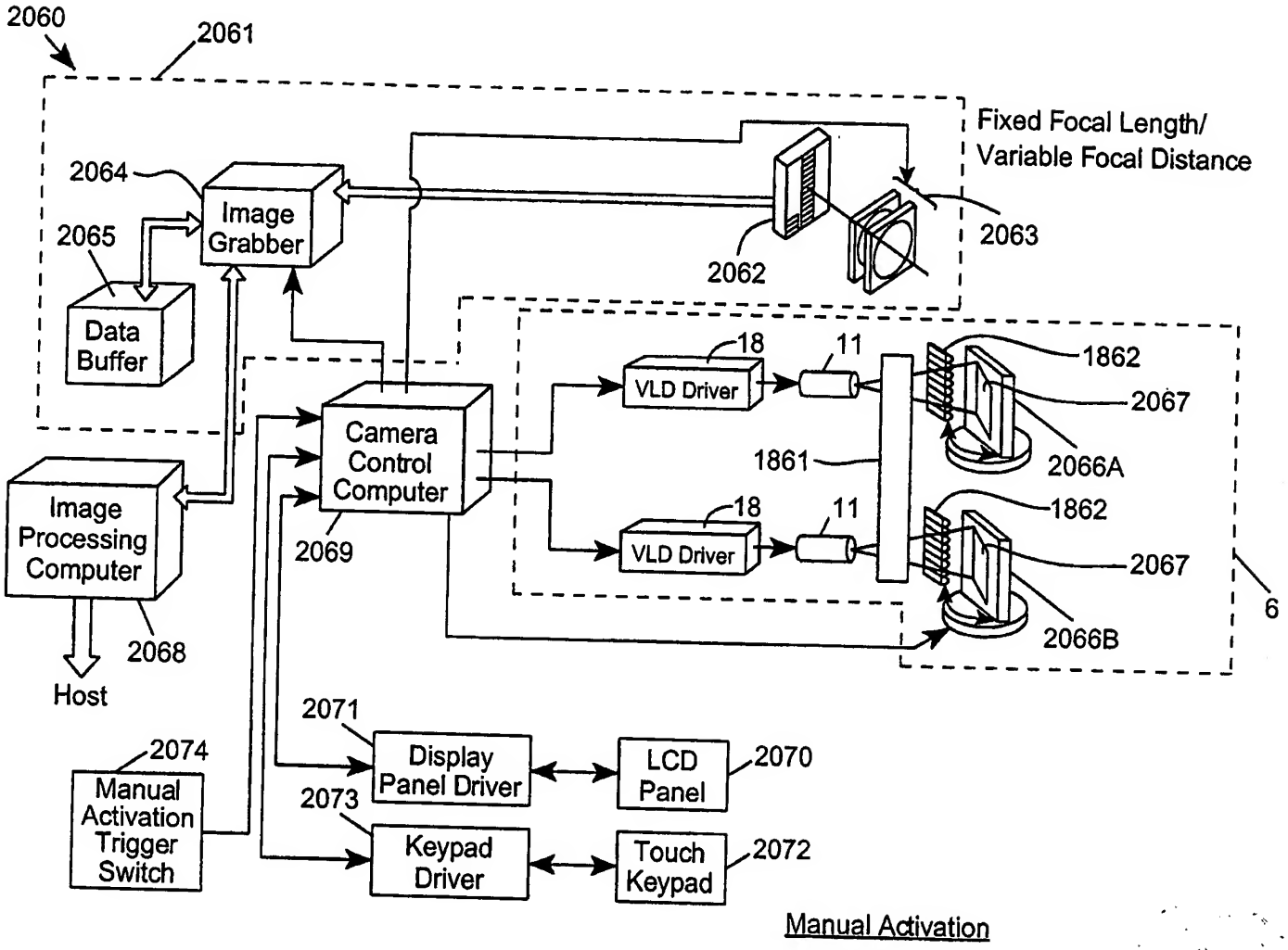


FIG. 53B1

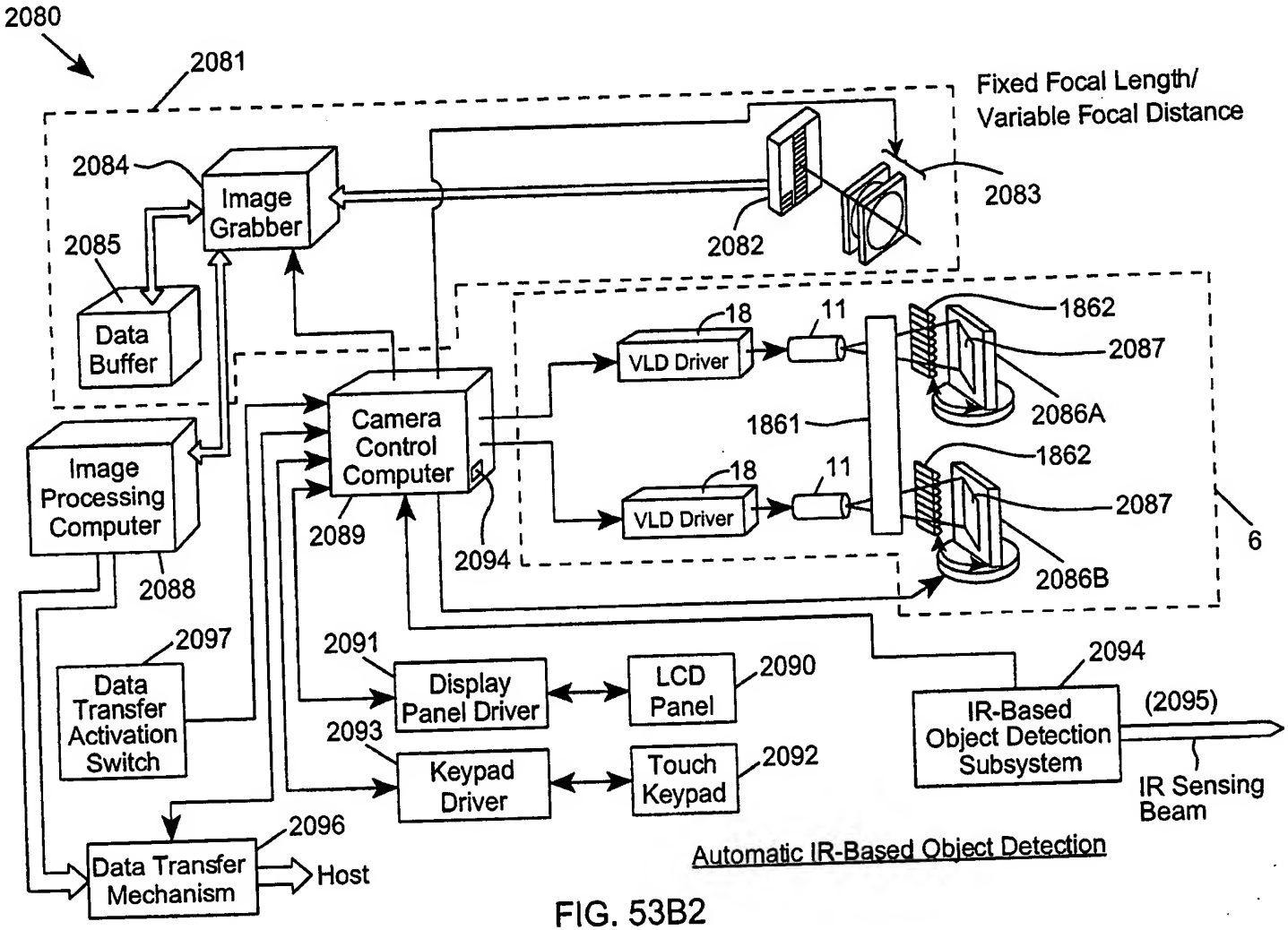


FIG. 53B2

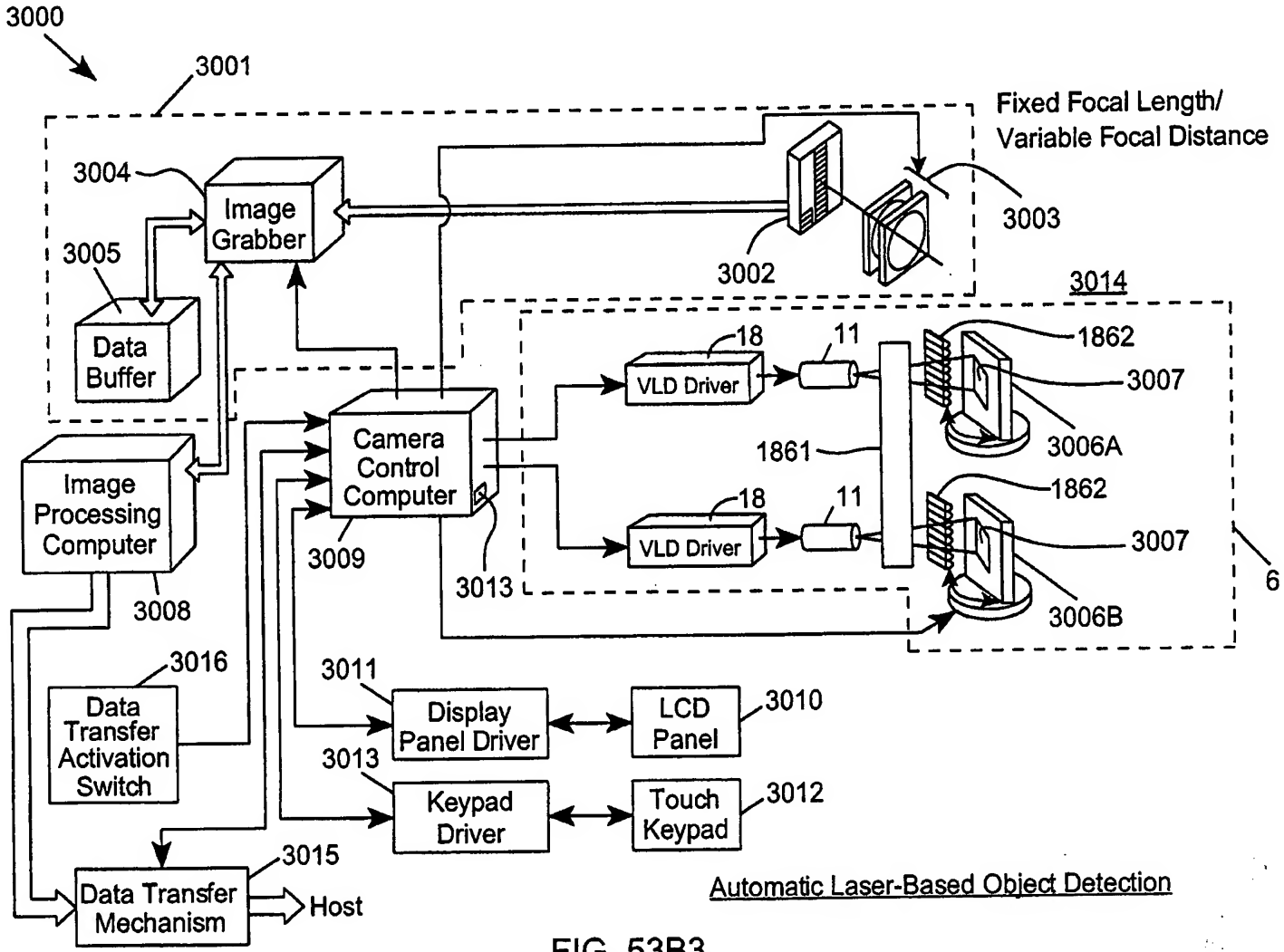

3000
3001
Fixed Focal Length/
Variable Focal Distance
3004
Image
Grabber
3005
Data
Buffer
3003
3002
3014
18
11
1862
VLD Driver
3007
3006A
1861
Camera
Control
Computer
Image
Processing
Computer
18
11
1862
VLD Driver
3007
3009
3013
3006B
6
3008
3016
3011
Data
Transfer
Activation
Switch
Display
Panel Driver
LCD
Panel
3010
3013
Keypad
Driver
Touch
Keypad
3012
3015
Data Transfer
Mechanism
Host
Automatic Laser-Based Object Detection

FIG. 53B3

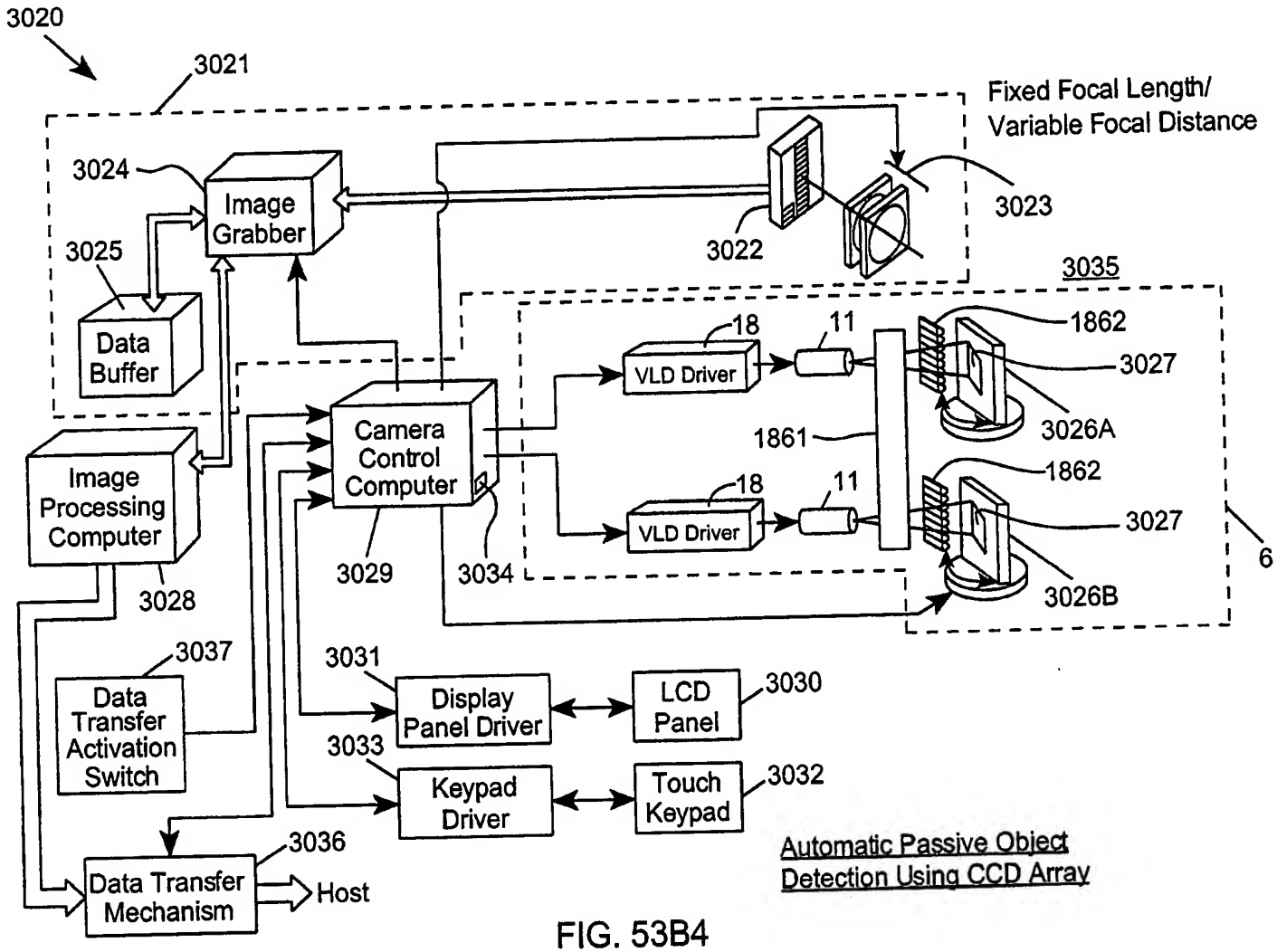

3020
3021
Fixed Focal Length/
Variable Focal Distance
3024
Image Grabber
3025
Data Buffer
3022
3023
3035
18
11
1862
VLD Driver
3027
3026A
1861
Camera Control Computer
Image Processing Computer
3028
3029
3034
18
11
1862
VLD Driver
3027
3026B
6
3037
Data Transfer Activation Switch
3031
Display Panel Driver
LCD Panel
3030
3033
Keypad Driver
Touch Keypad
3032
3036
Data Transfer Mechanism
Host
Automatic Passive Object Detection Using CCD Array

FIG. 53B4

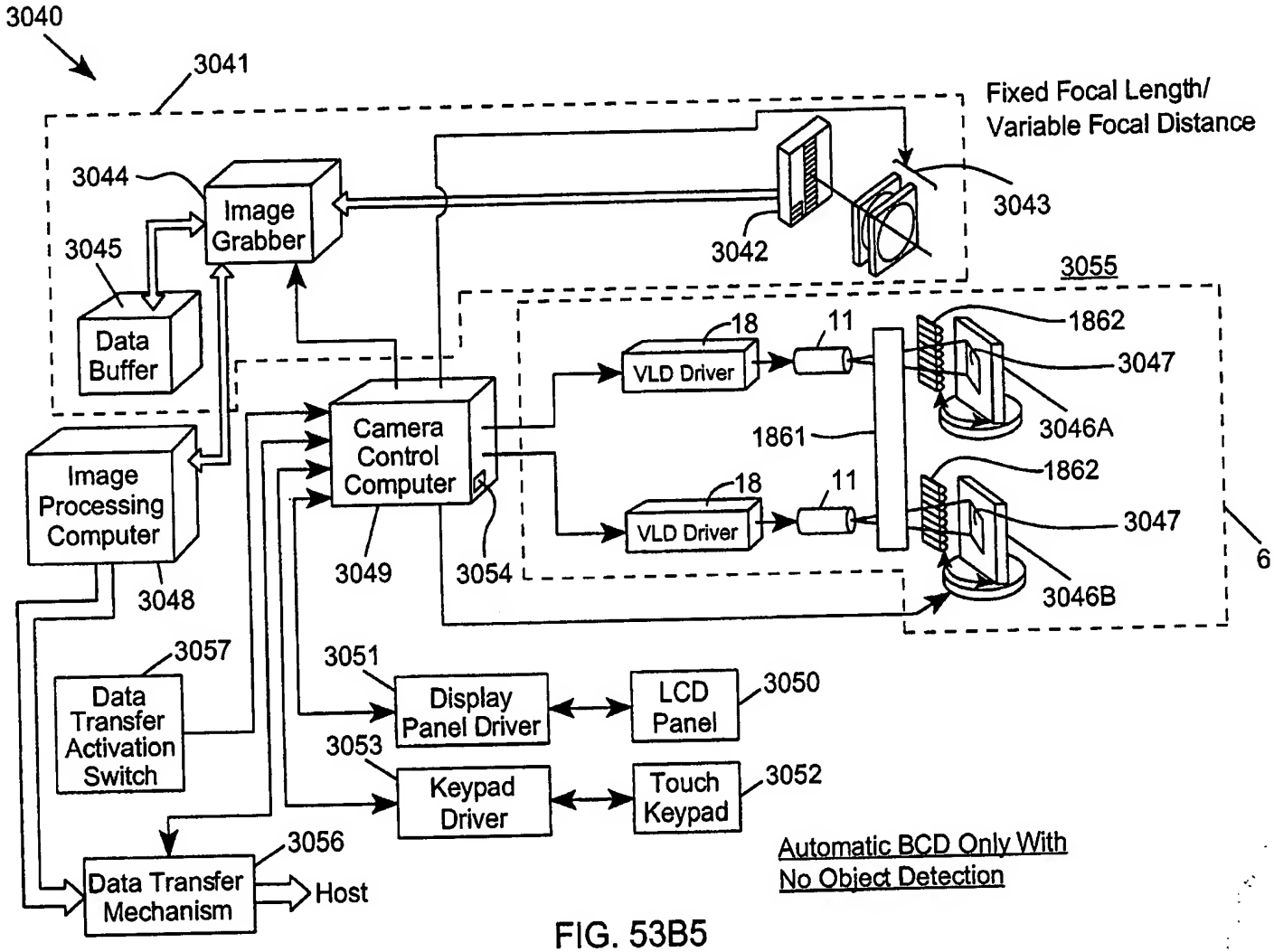

3040
3041
Fixed Focal Length/
Variable Focal Distance
3044
Image
Grabber
3045
Data
Buffer
3042
3043
3055
18
11
1862
VLD Driver
3047
3046A
1861
Camera
Control
Computer
Image
Processing
Computer
3048
3049
3054
18
11
1862
VLD Driver
3047
3046B
6
3057
Data
Transfer
Activation
Switch
3051
Display
Panel Driver
LCD
Panel
3050
3053
Keypad
Driver
Touch
Keypad
3052
3056
Data Transfer
Mechanism
Host
Automatic BCD Only With
No Object Detection

FIG. 53B5

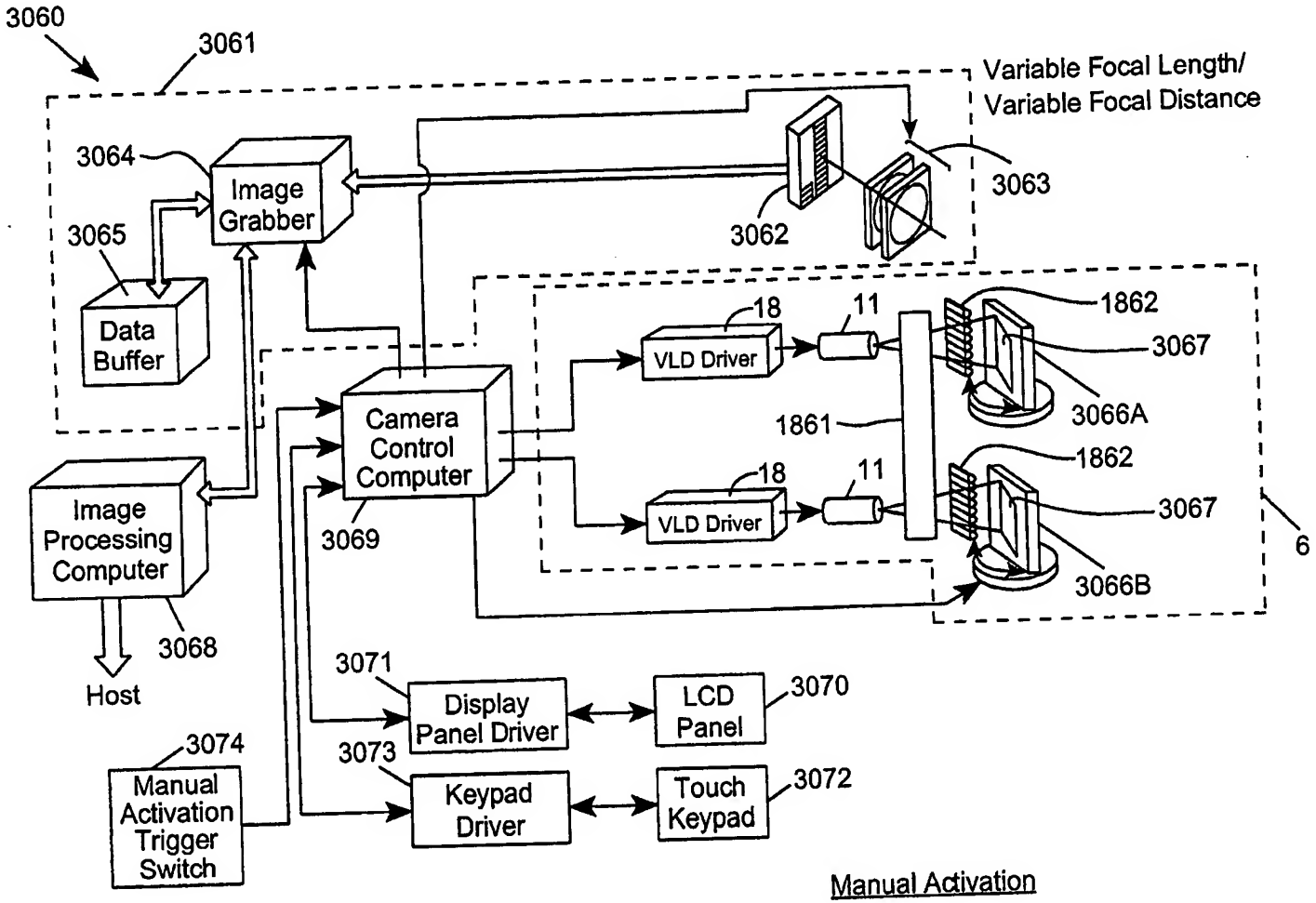

3064
Image Grabber
3065
Data Buffer
3062
3063
18
11
1862
VLD Driver
3067
3066A
1861
Camera Control Computer
3069
Image Processing Computer
3068
Host
VLD Driver
3066B
6
3071
Display Panel Driver
LCD Panel
3070
3073
Keypad Driver
Touch Keypad
3072
3074
Manual Activation Trigger Switch
Manual Activation

FIG. 53C1

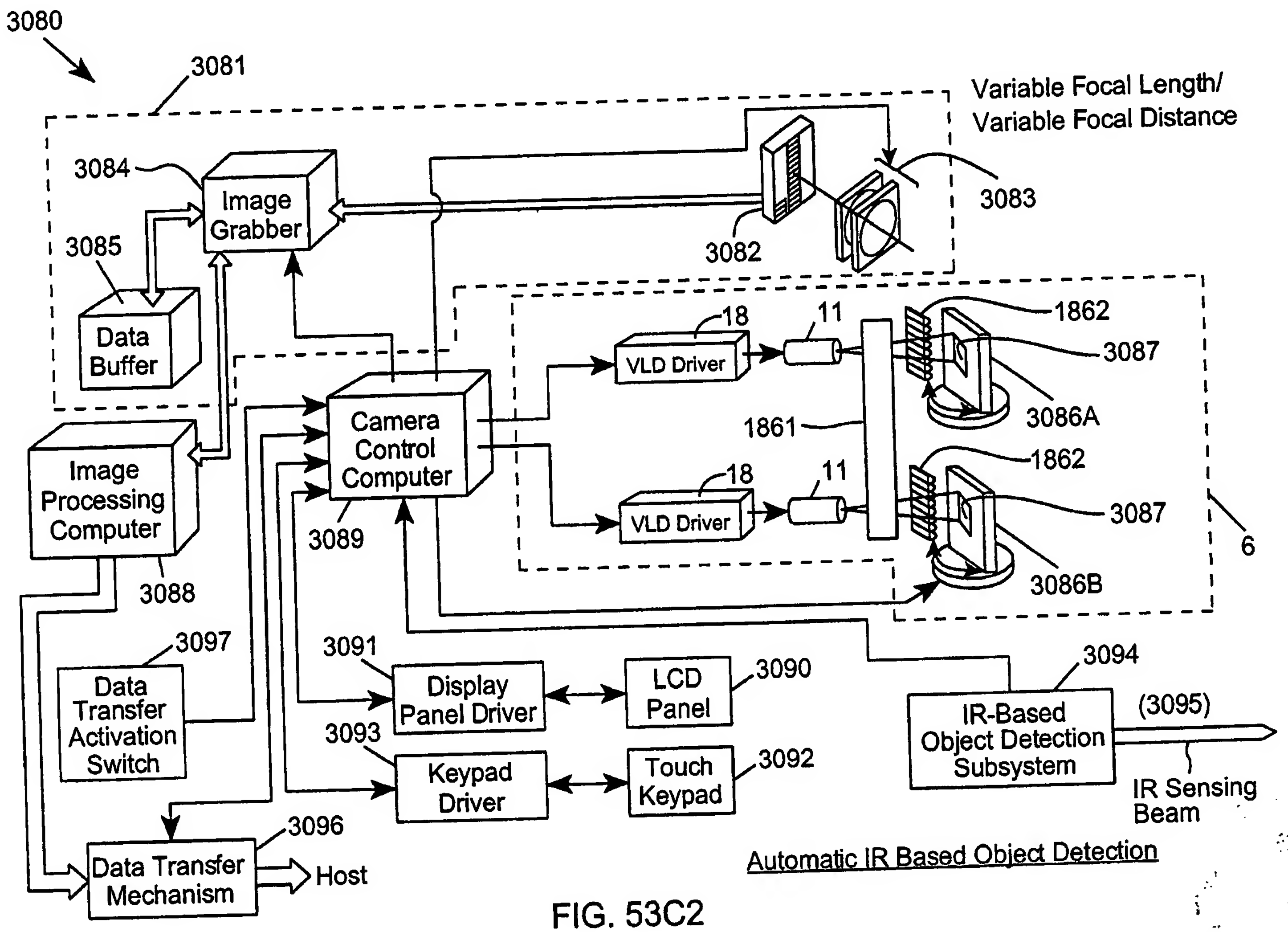

3080
3081
Variable Focal Length/
Variable Focal Distance
3084
Image
Grabber
3083
3085
3082
Data
Buffer
18
11
1862
VLD Driver
3087
Camera
Control
Computer
3086A
1861
1862
Image
Processing
Computer
18
11
VLD Driver
3087
3089
6
3088
3086B
3097
3091
3094
Data
Transfer
Activation
Switch
Display
Panel Driver
LCD
Panel
3090
IR-Based
Object Detection
Subsystem
(3095)
3093
Keypad
Driver
Touch
Keypad
3092
IR Sensing
Beam
3096
Data Transfer
Mechanism
Host
Automatic IR Based Object Detection

FIG. 53C2

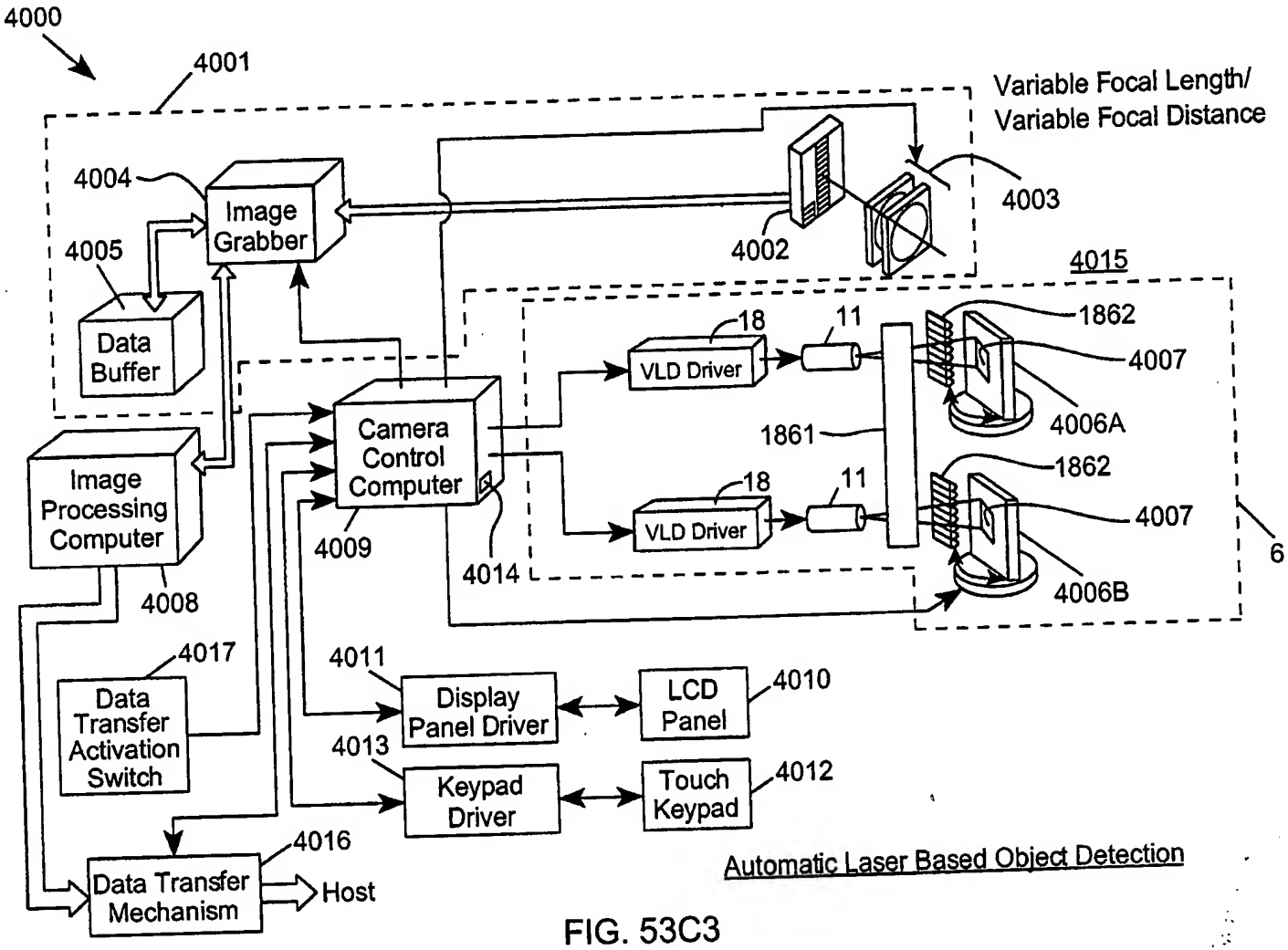

4000
4001
Variable Focal Length/
Variable Focal Distance
4004
Image
Grabber
4005
Data
Buffer
4002
4003
4015
18
11
1862
VLD Driver
4007
4006A
1861
Camera
Control
Computer
Image
Processing
Computer
4009
4014
18
11
1862
VLD Driver
4007
4006B
6
4008
4017
Data
Transfer
Activation
Switch
4011
Display
Panel Driver
LCD
Panel
4010
4013
Keypad
Driver
Touch
Keypad
4012
4016
Data Transfer
Mechanism
Host
Automatic Laser Based Object Detection

FIG. 53C3

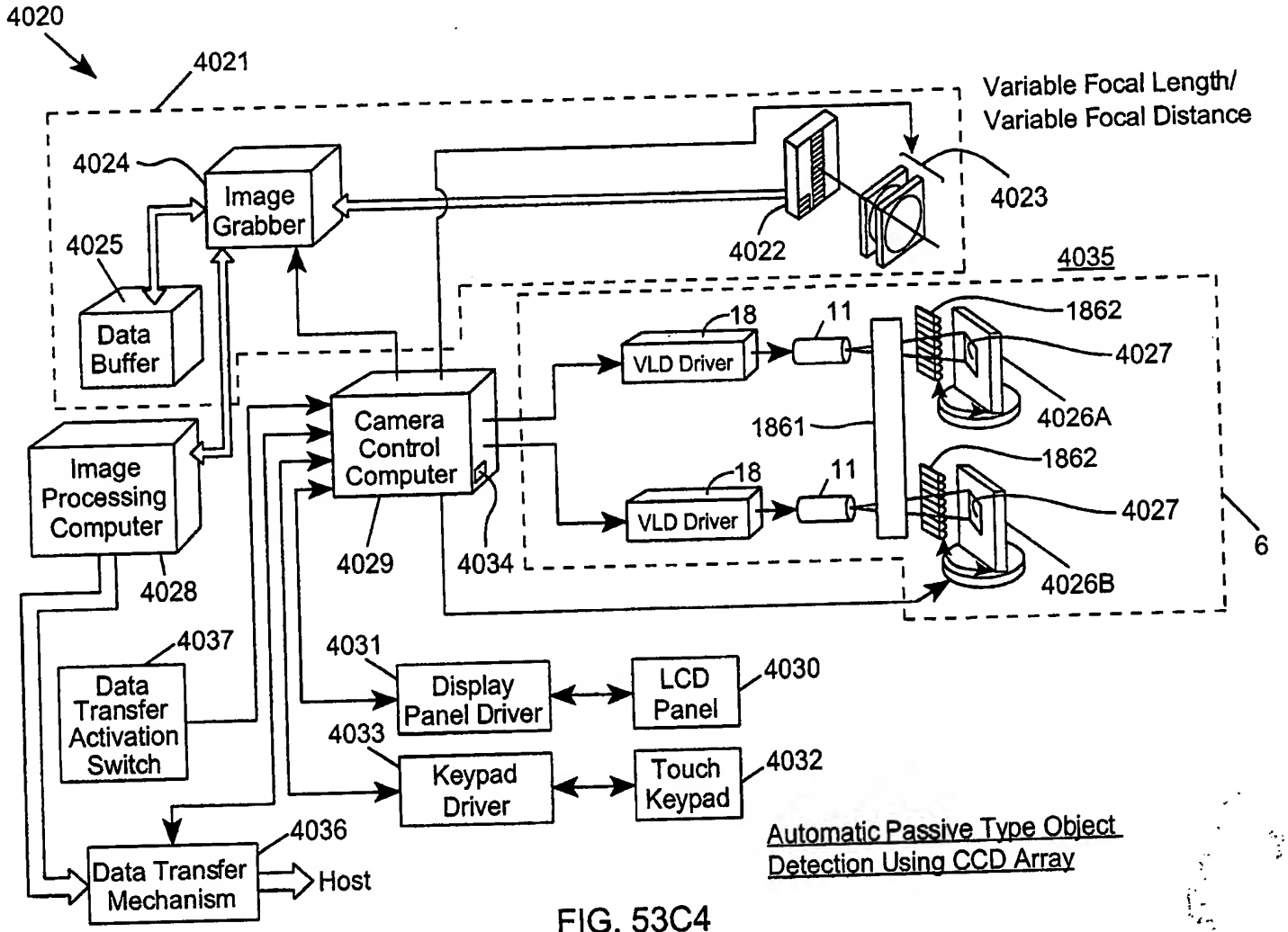

4020
4021
Variable Focal Length/
Variable Focal Distance
4024
Image Grabber
4025
Data Buffer
4022
4023
4035
18
11
1862
VLD Driver
4027
4026A
1861
Camera Control Computer
Image Processing Computer
18
11
1862
VLD Driver
4027
6
4029
4034
4028
4026B
4037
4031
Data Transfer Activation Switch
Display Panel Driver
LCD Panel
4030
4033
Keypad Driver
Touch Keypad
4032
4036
Data Transfer Mechanism
Host
Automatic Passive Type Object Detection Using CCD Array

FIG. 53C4

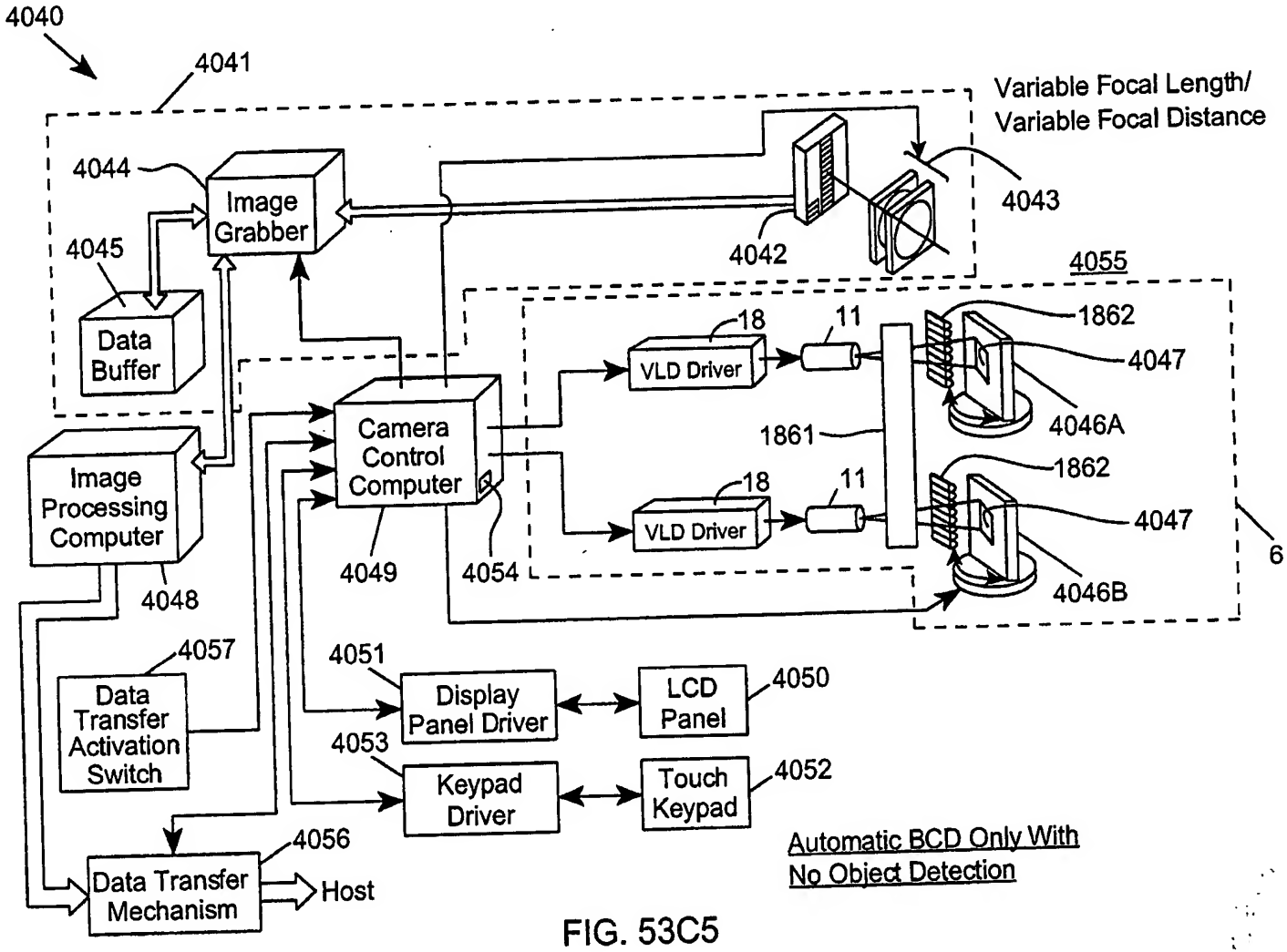


FIG. 53C5

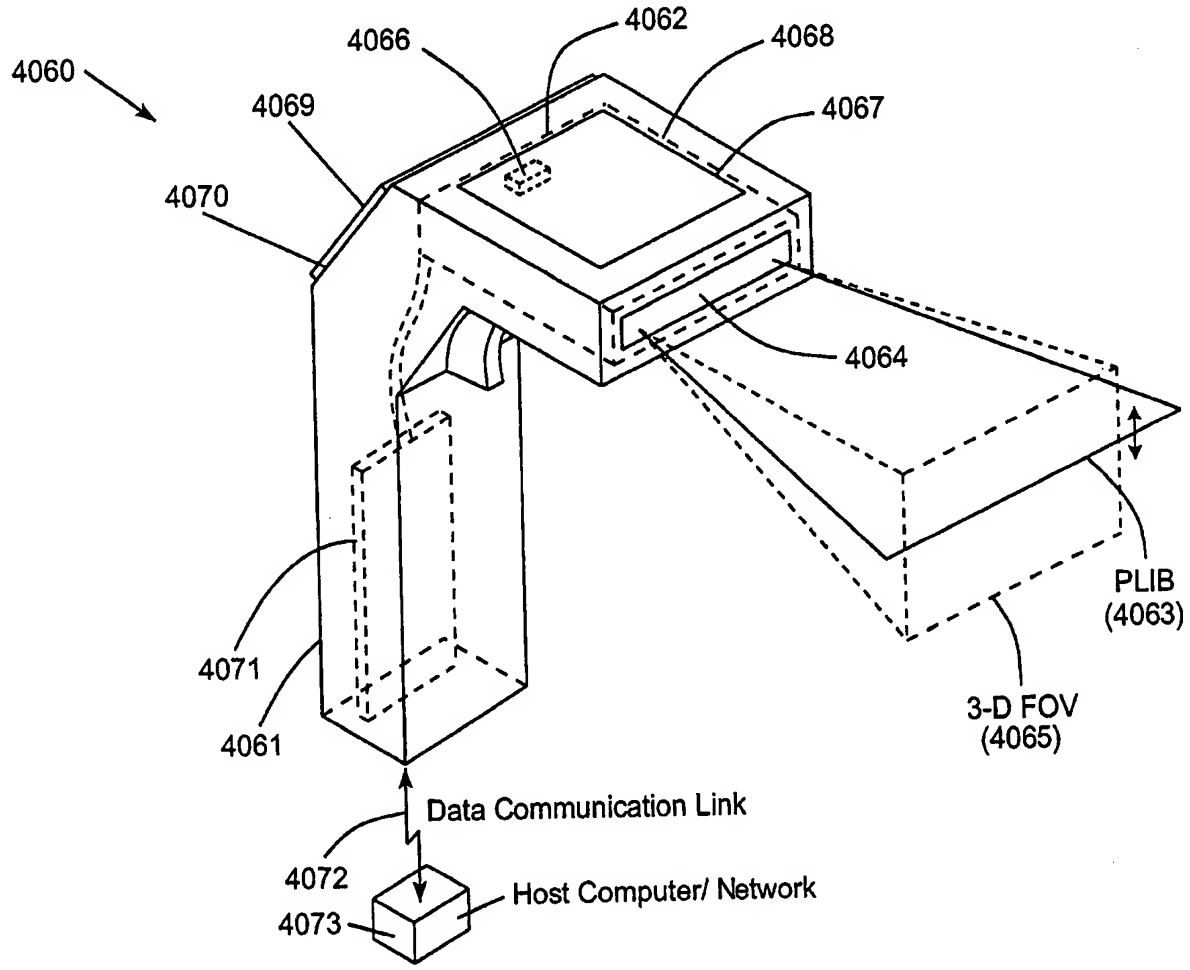

4060
4066
4062
4068
4069
4067
4070
4064
PLIB
(4063)
4071
4061
3-D FOV
(4065)
Data Communication Link
4072
Host Computer/ Network
4073

FIG. 54A

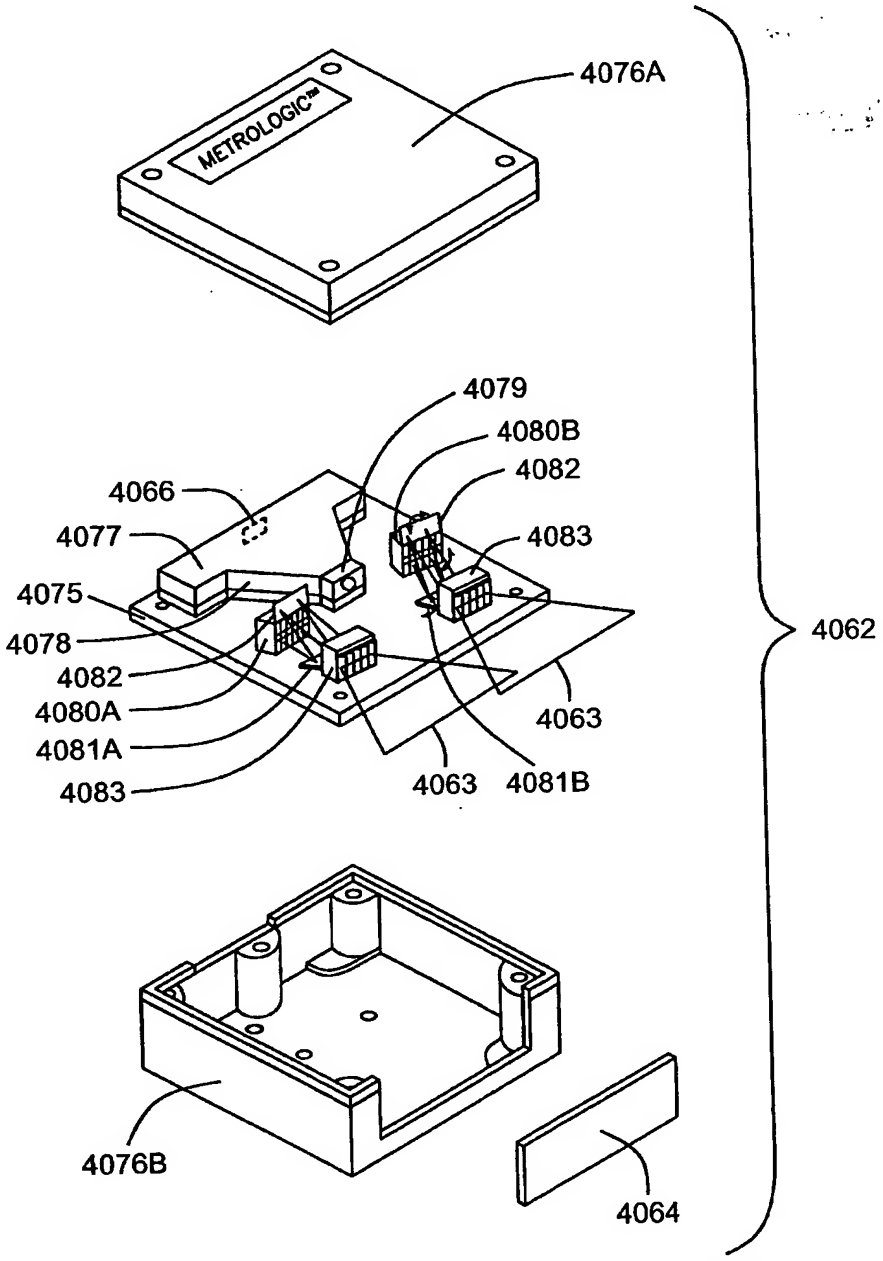

METROLOGIC
4076A
4079
4080B
4082
4066
4083
4077
4075
4078
4082
4080A
4081A
4083
4063
4081B
4063
4062
4076B
4064
(Dual Mirrors)
Fig. 115A-5D

FIG. 54B

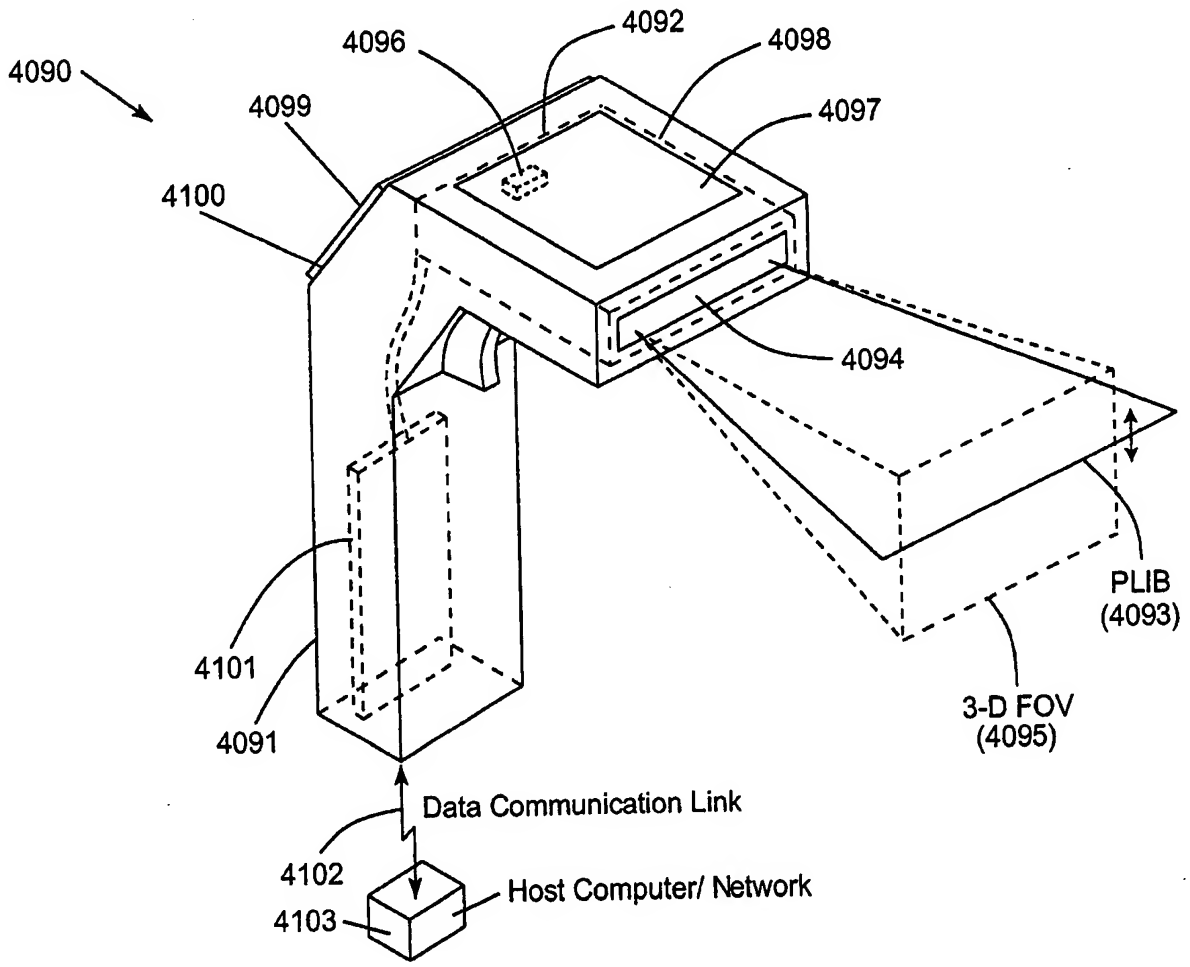
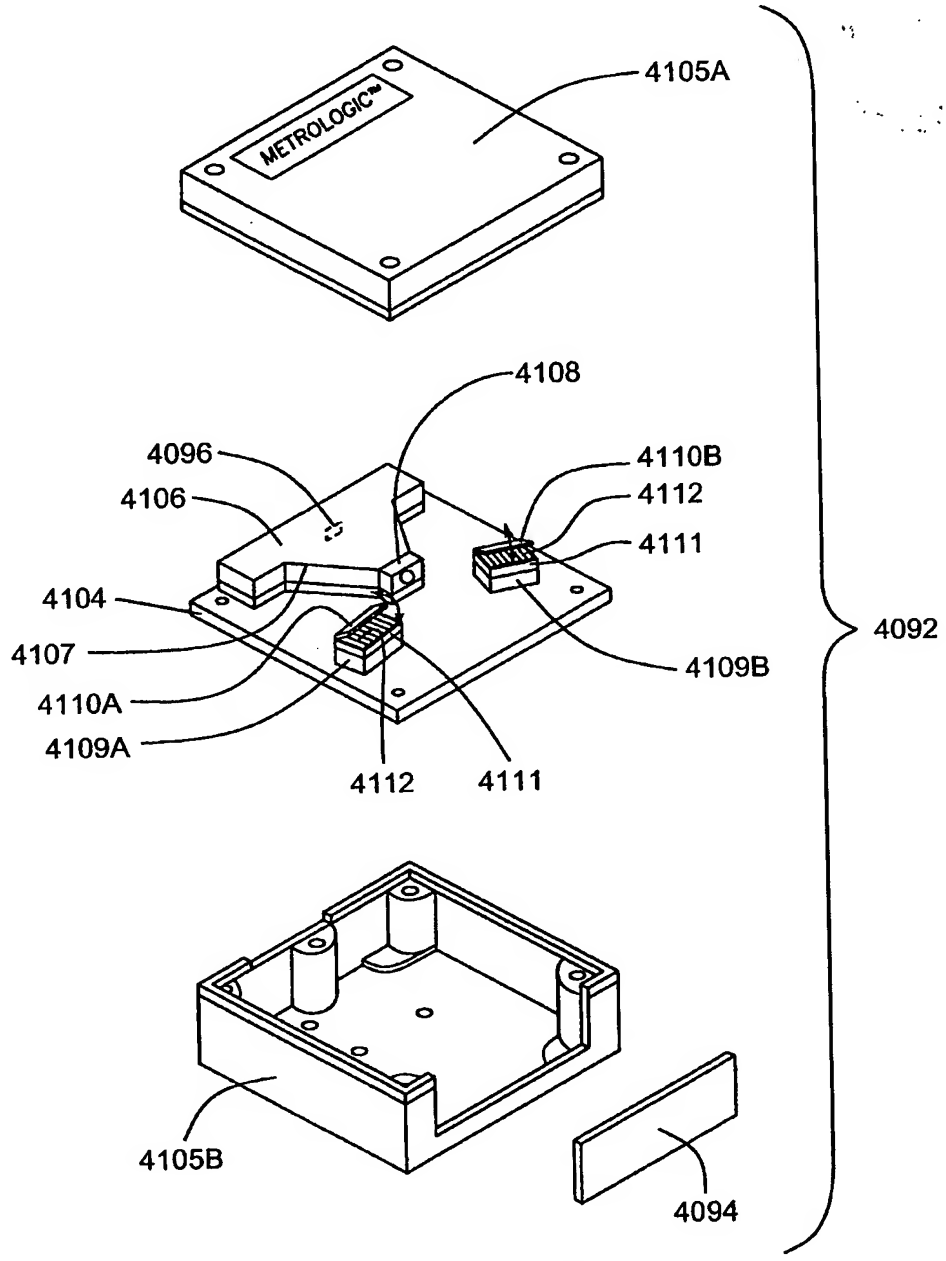

4090
4096
4092
4098
4099
4097
4100
4094
PLIB
(4093)
4101
4091
3-D FOV
(4095)
Data Communication Link
4102
Host Computer/ Network
4103

FIG. 55A



Bragg Cell
Fig. 1I6A-6B

FIG. 55B

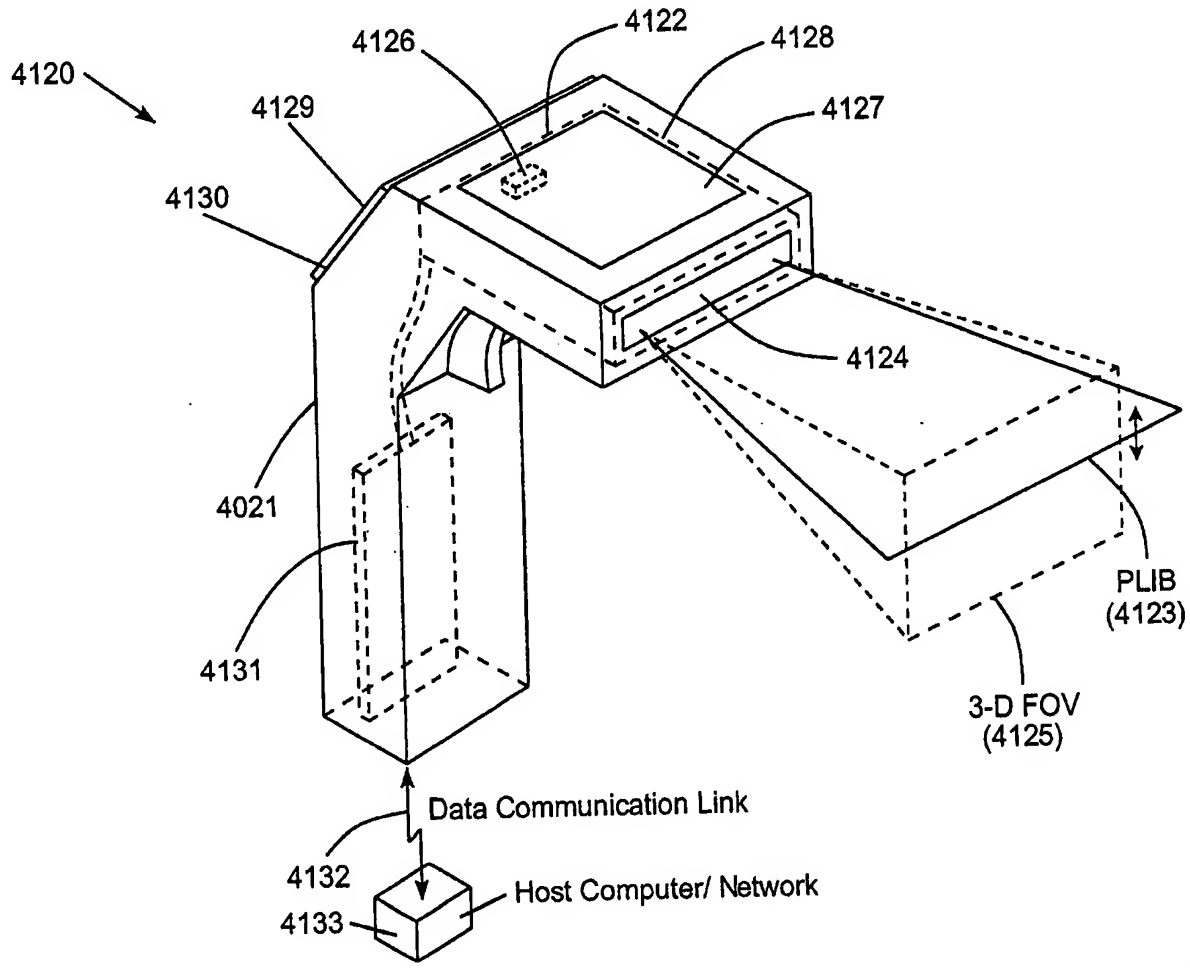
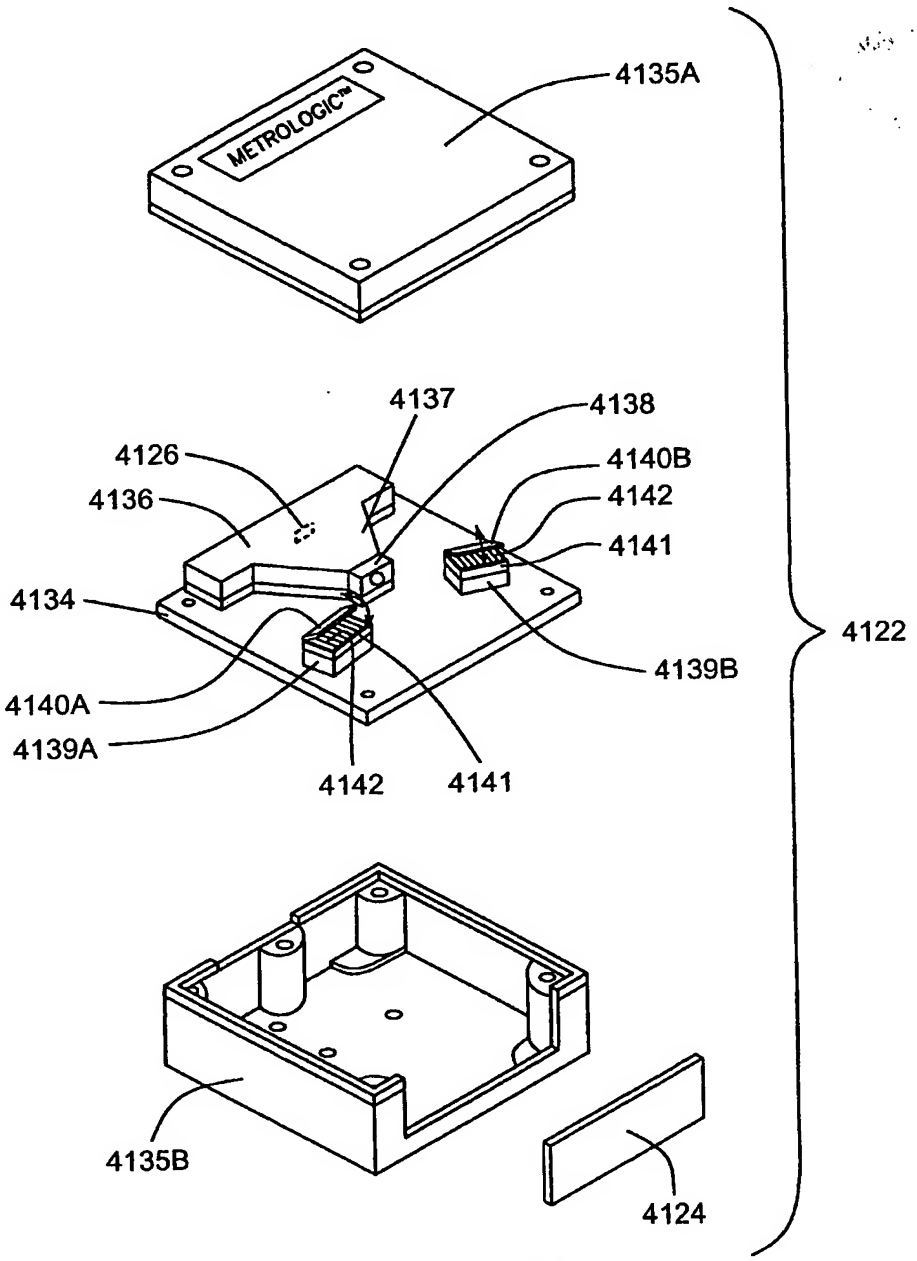


FIG. 56A



DM
Fig. 1I7A-7B

FIG. 56B

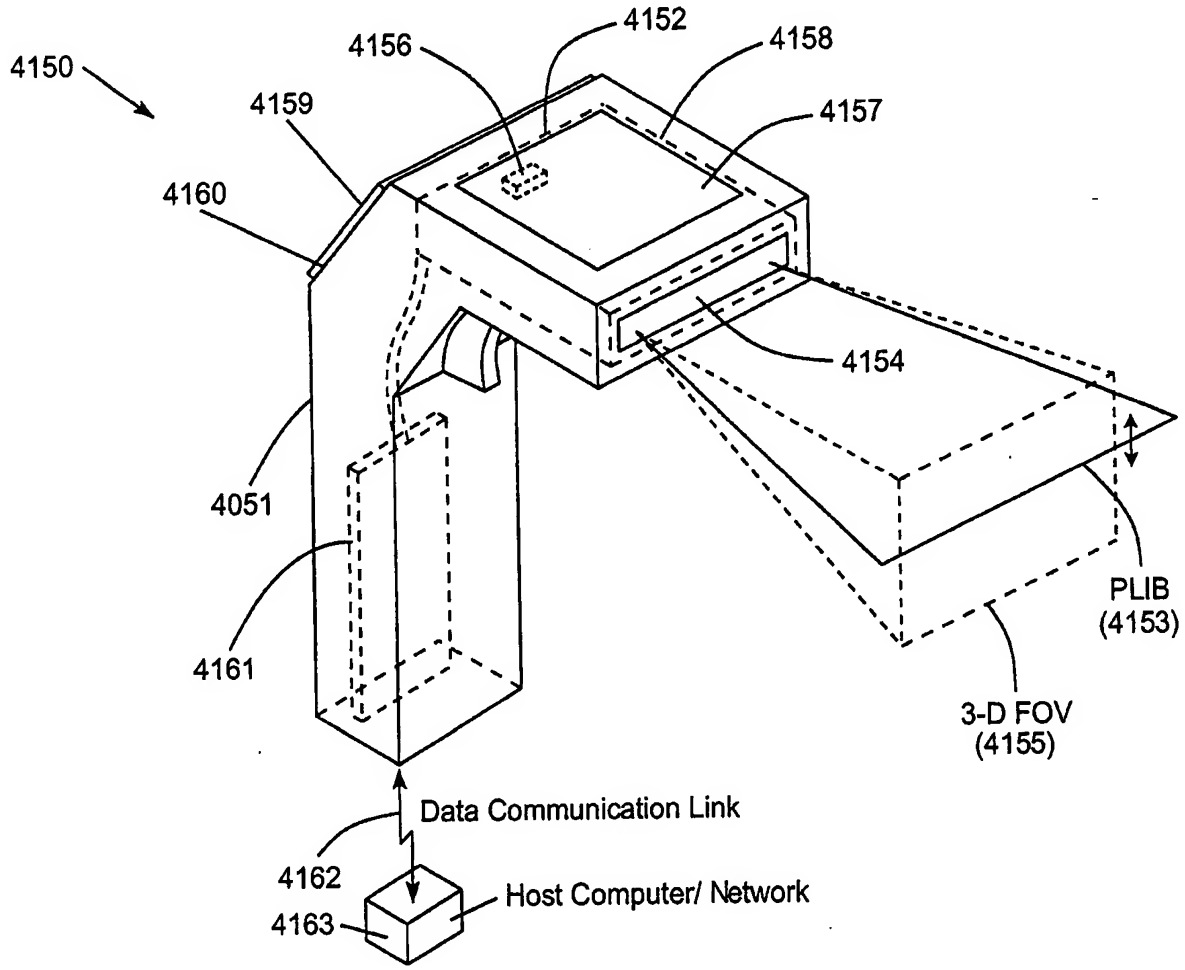


FIG. 57A

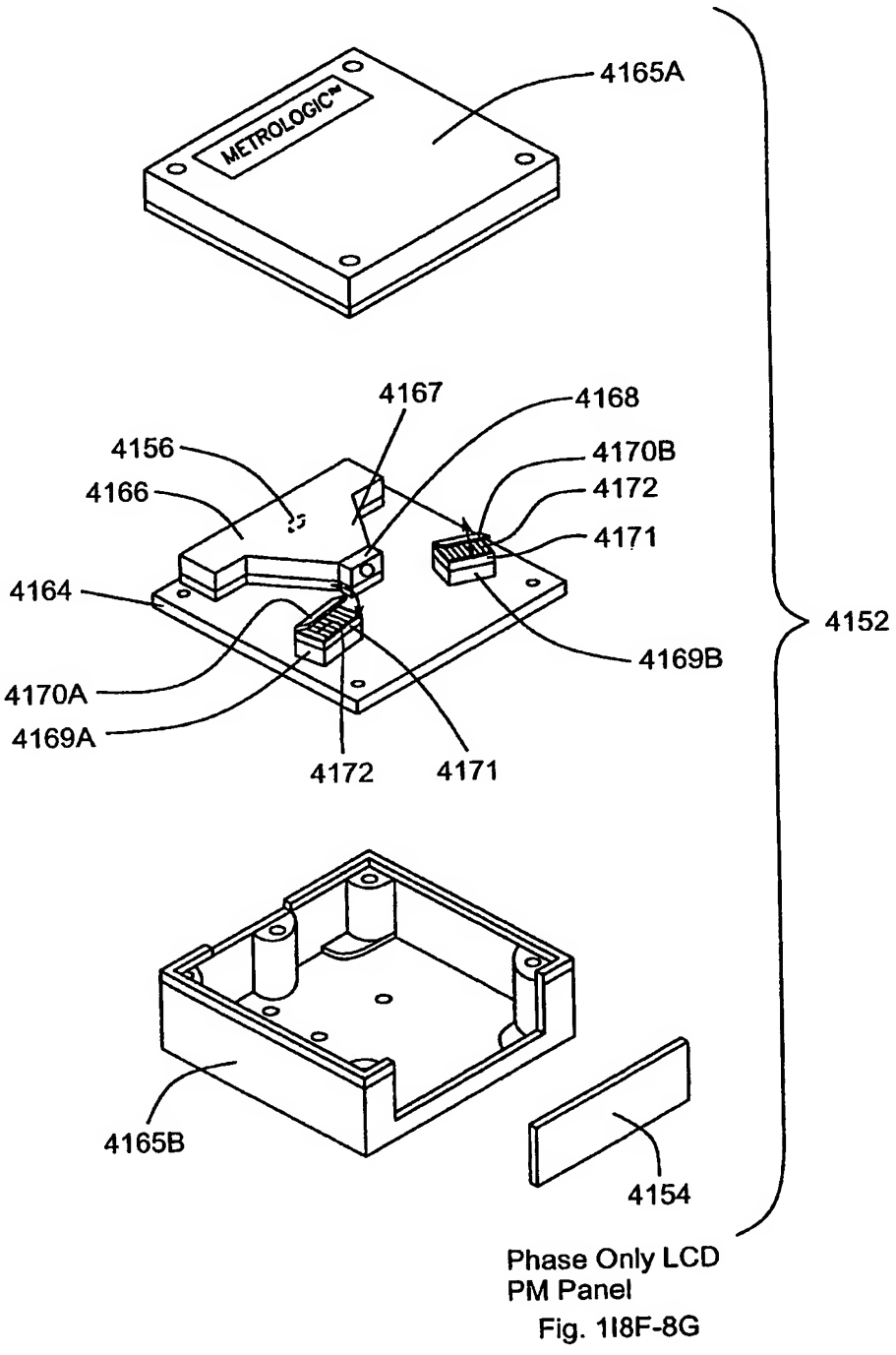


Fig. 118F-8G

FIG. 57B

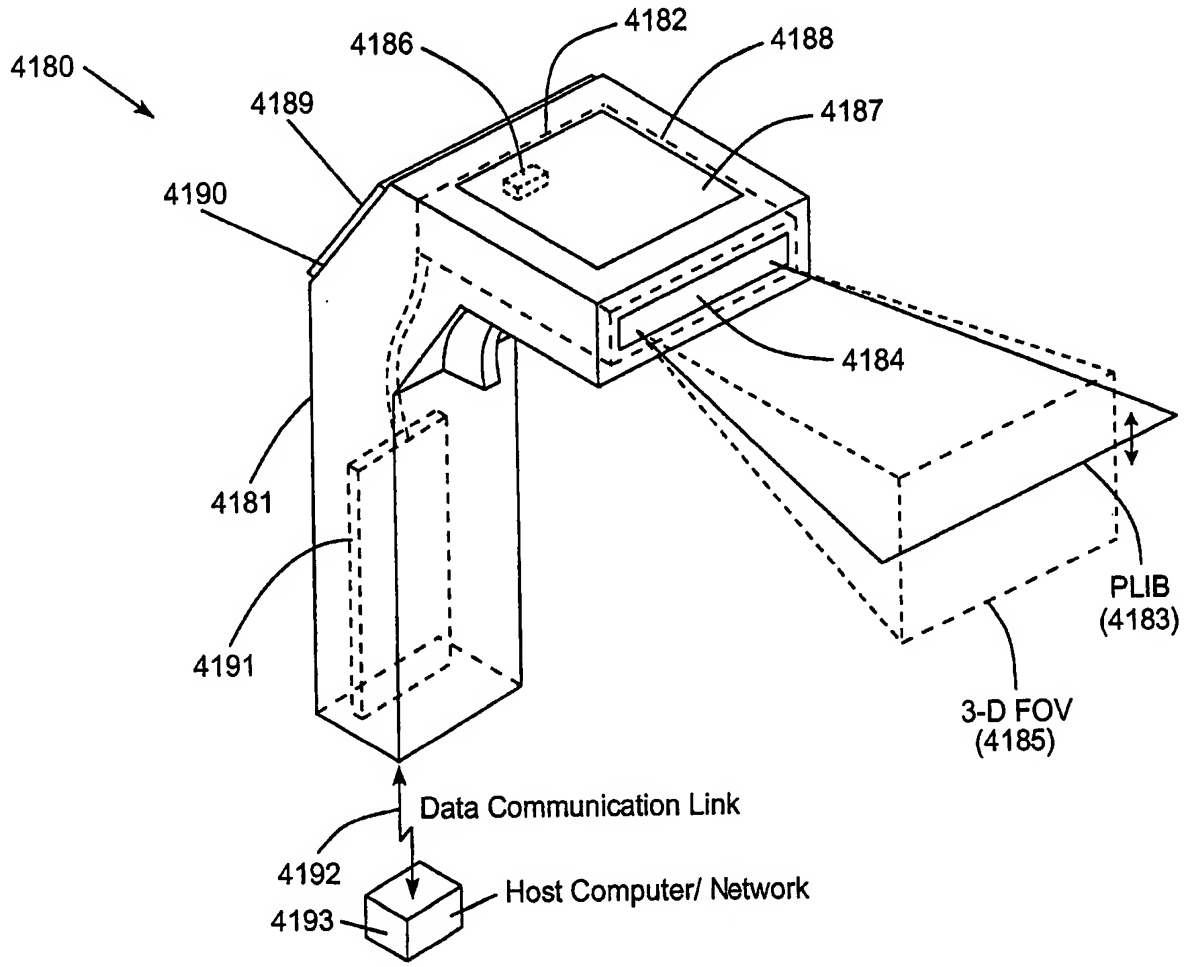
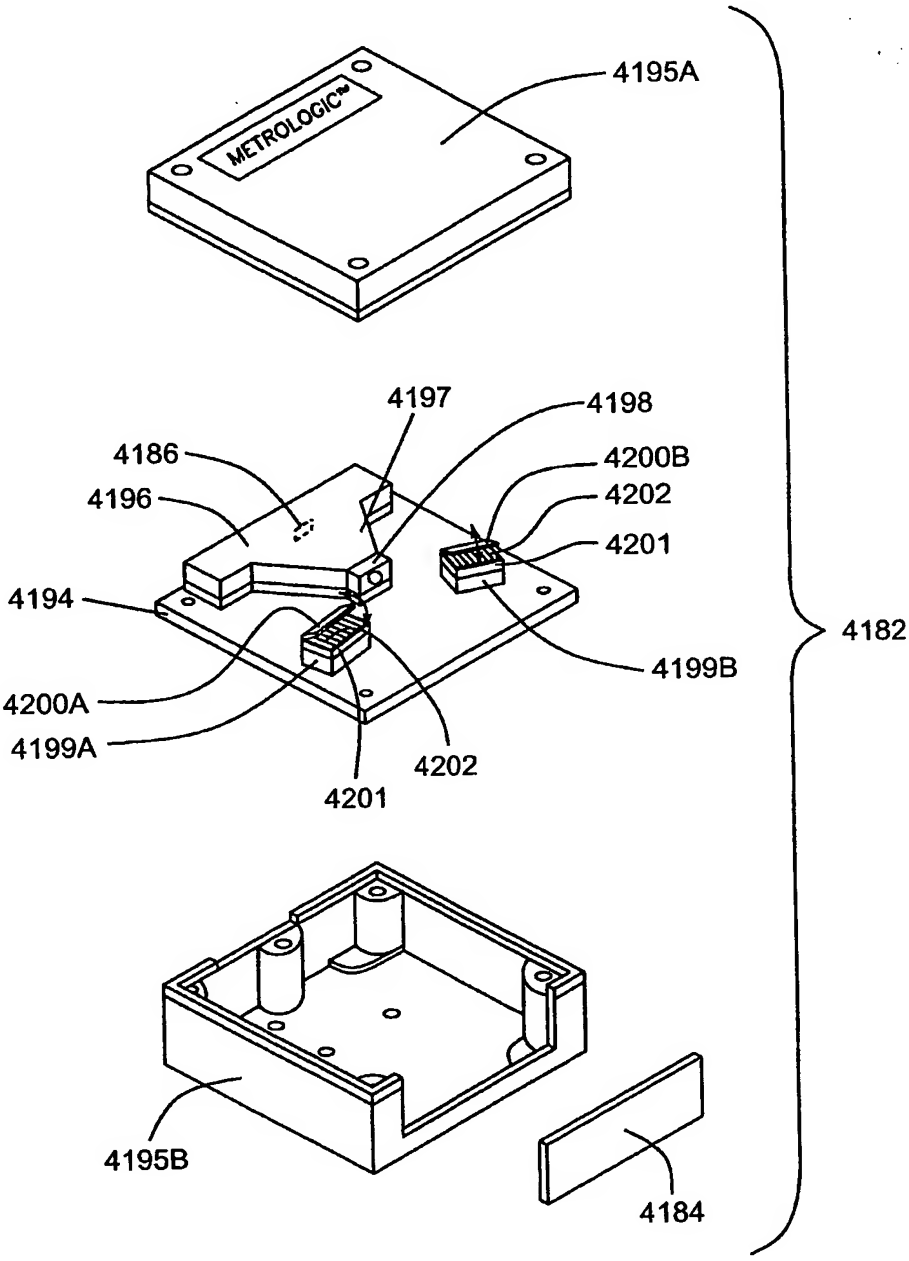


FIG. 58A



HS Optical Shutter
Fig. 1I14A-14B

FIG. 58B

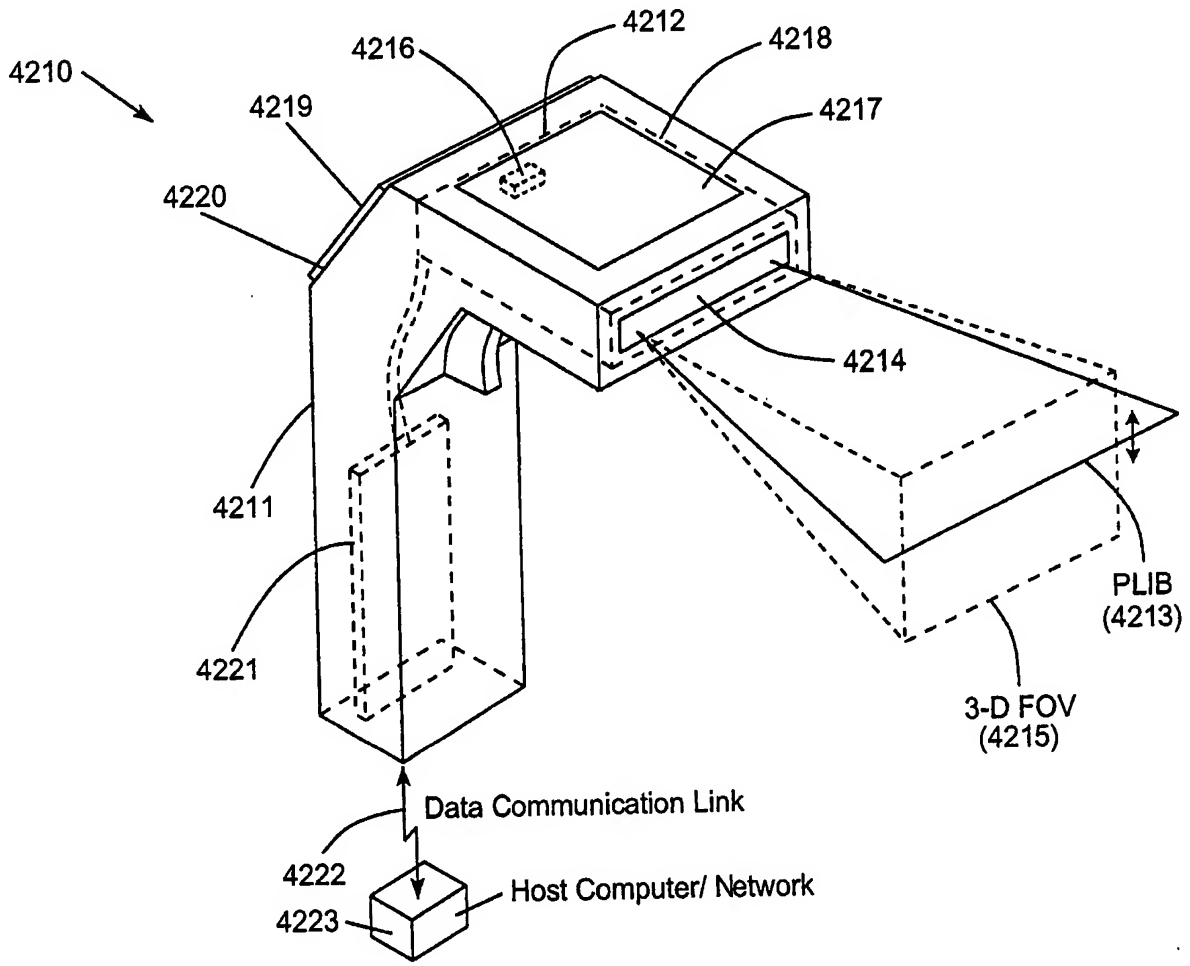
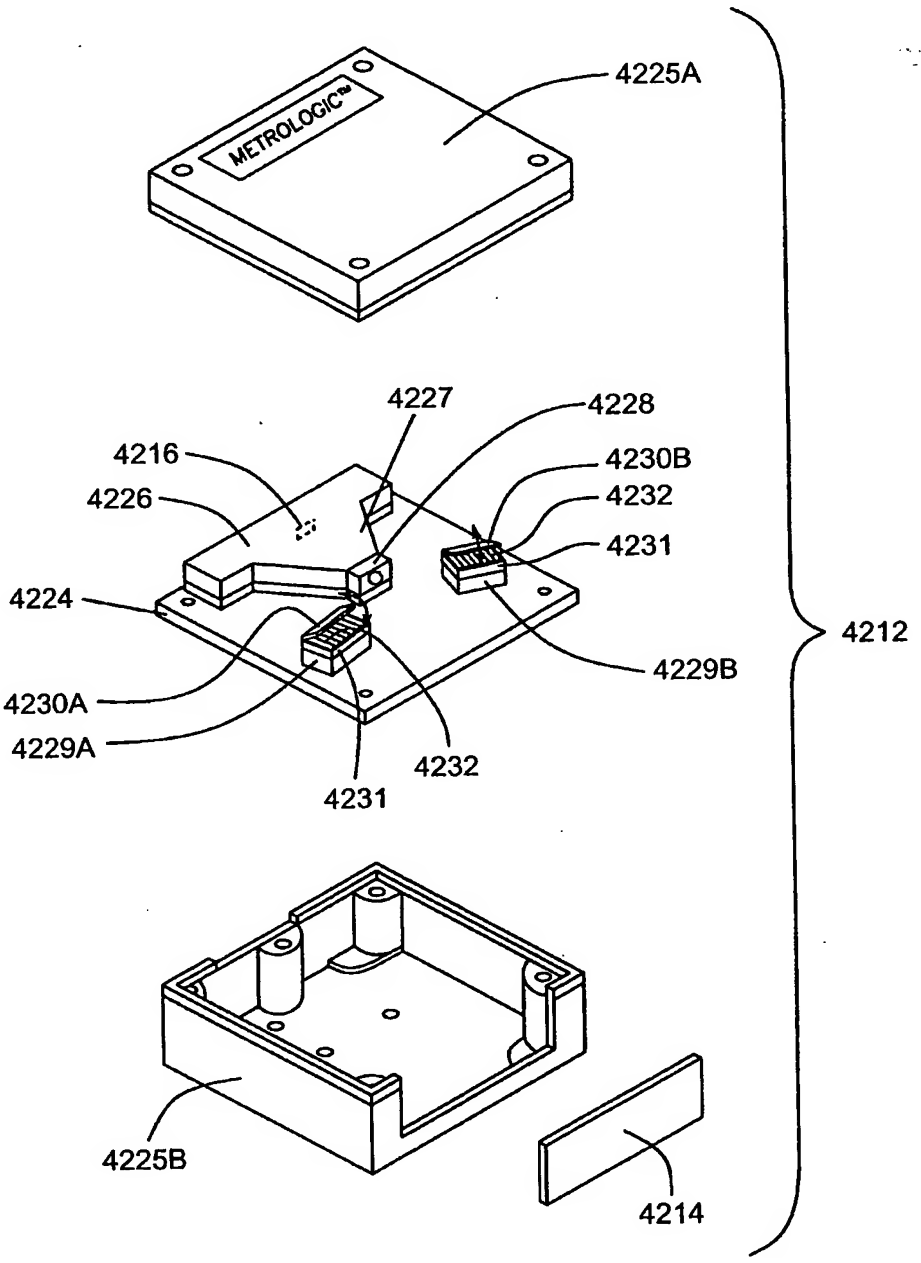


FIG. 59A



MLLD

Fig. 1I15A-15B

FIG. 59B

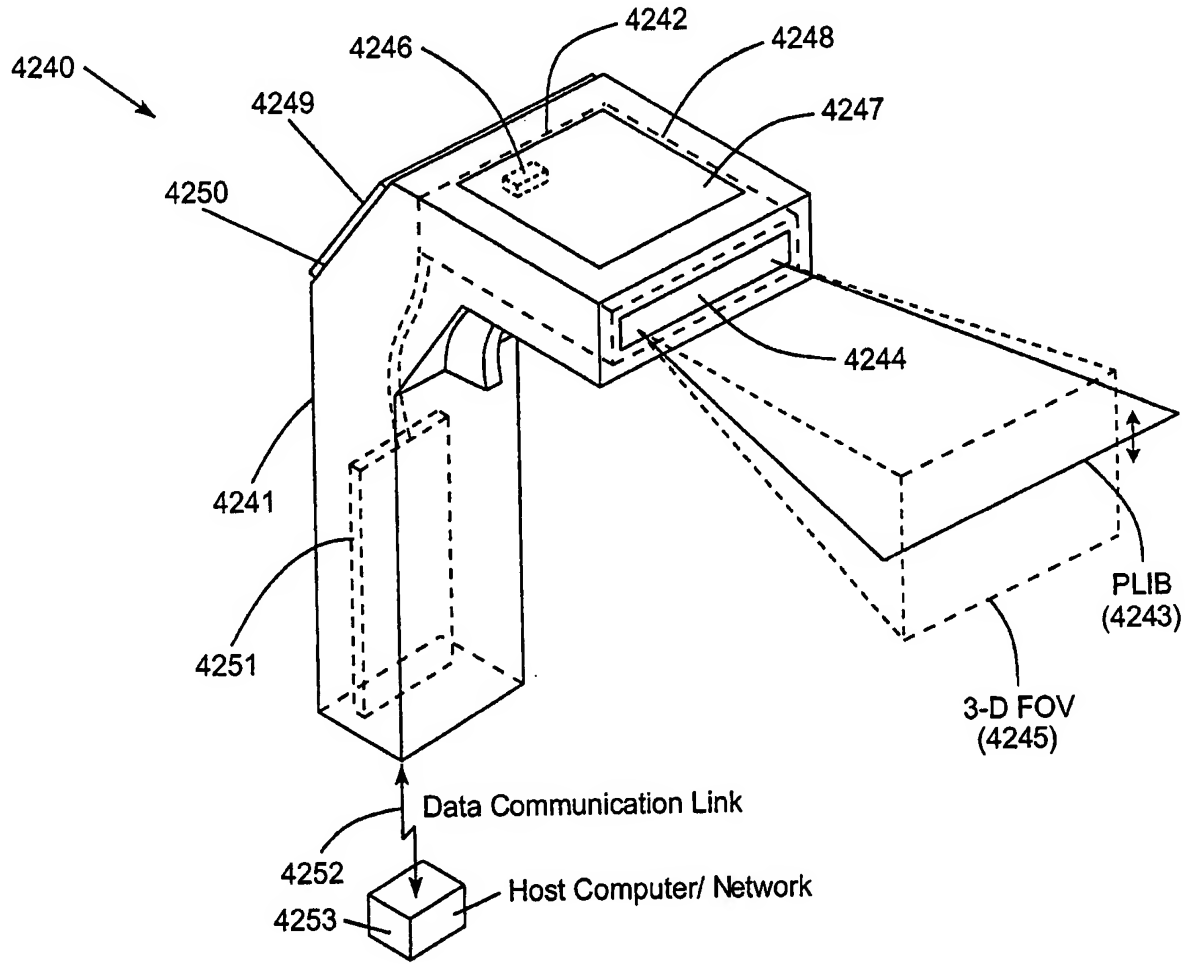
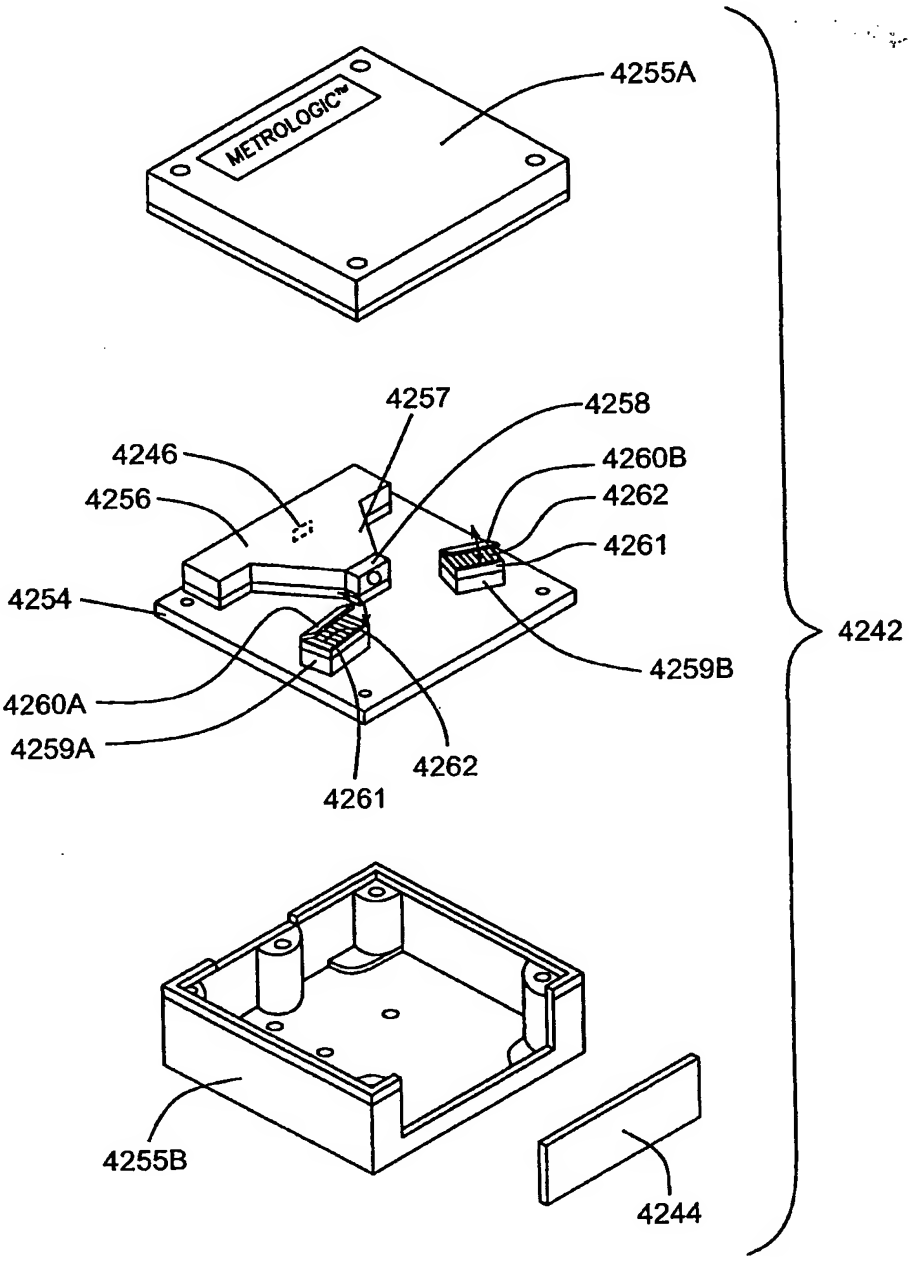


FIG. 60A



Etalon (Temp. Phase Mod.)

Fig. 1I17A-17B

FIG. 60B

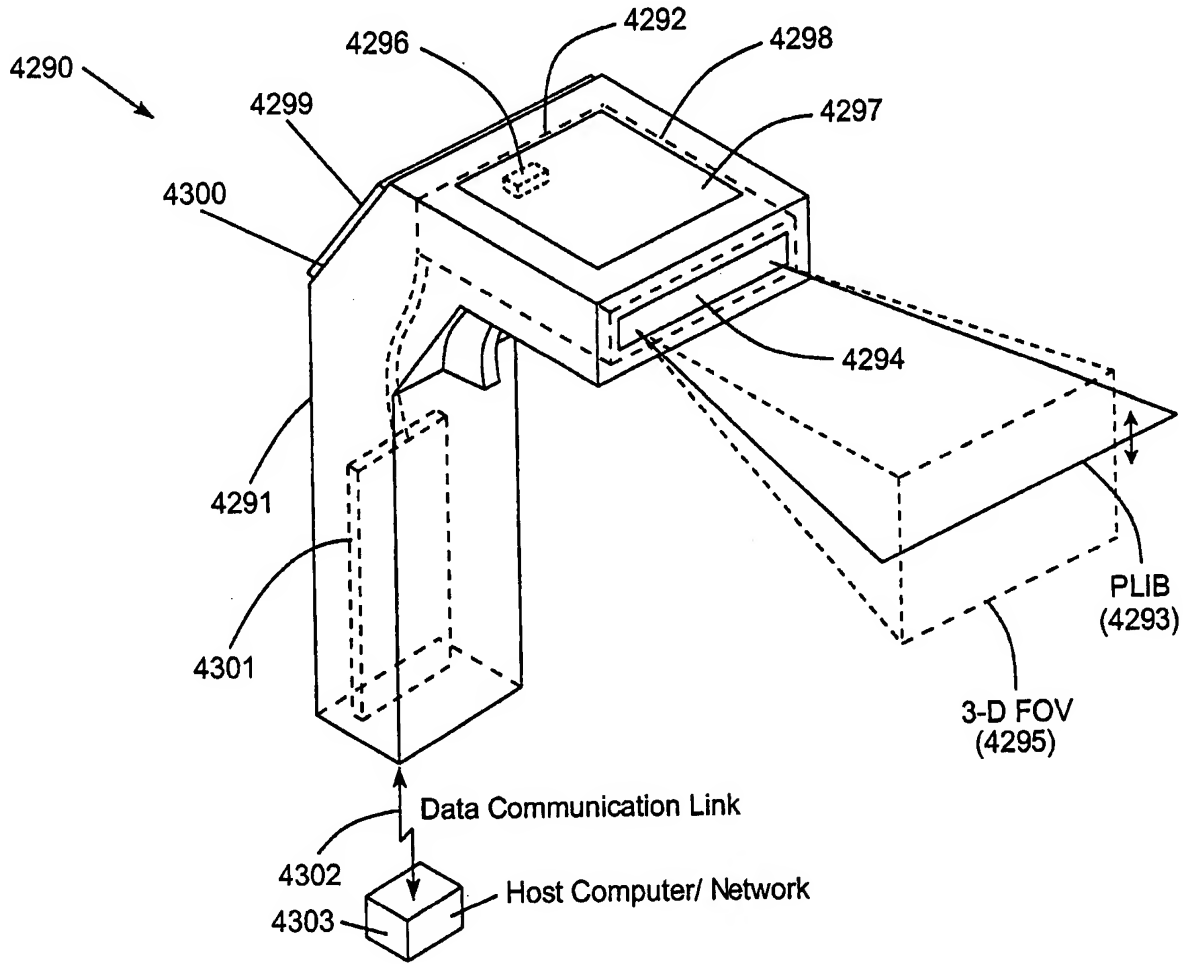
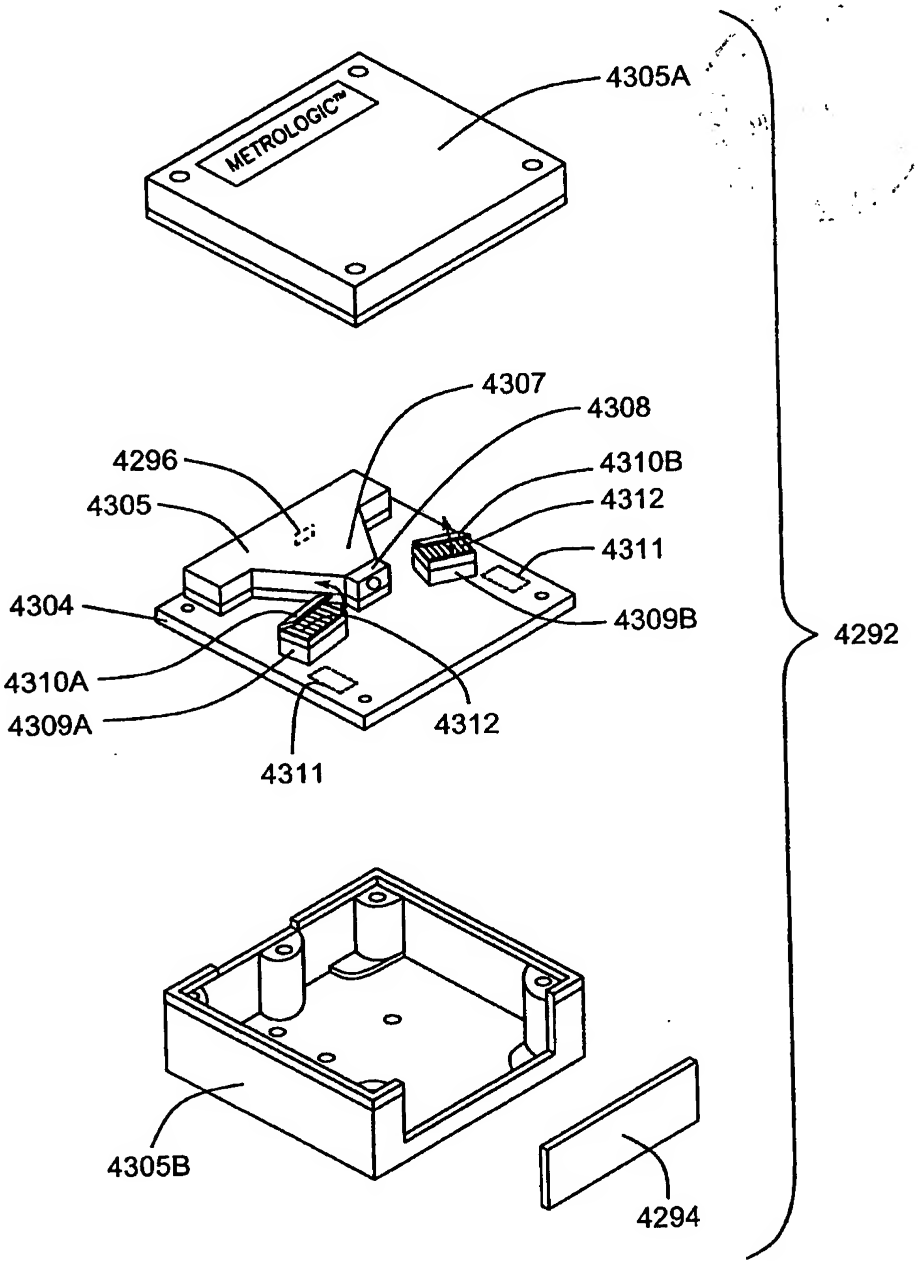


FIG. 61A



Mode Hopping
Fig. 1I19A-19B

FIG. 61B

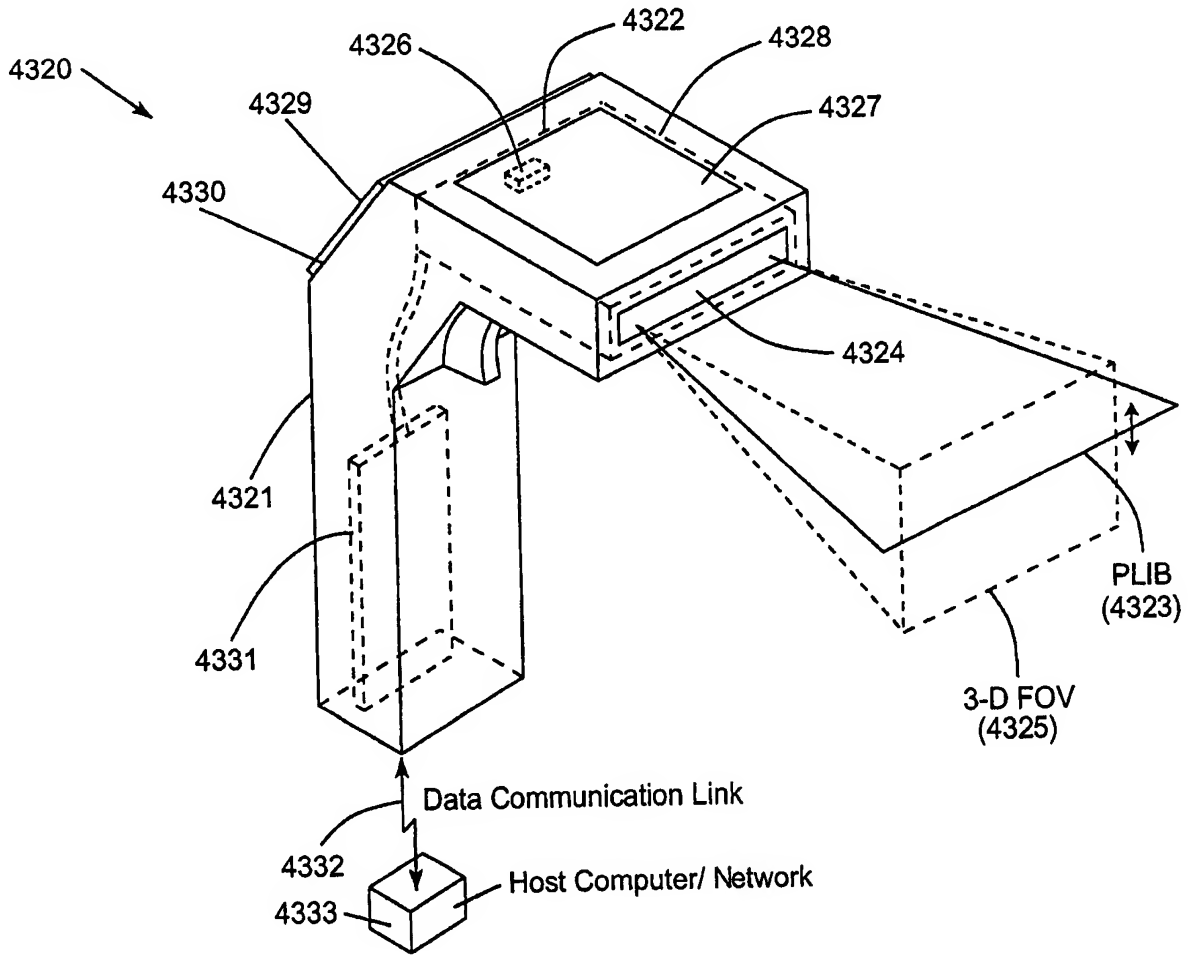
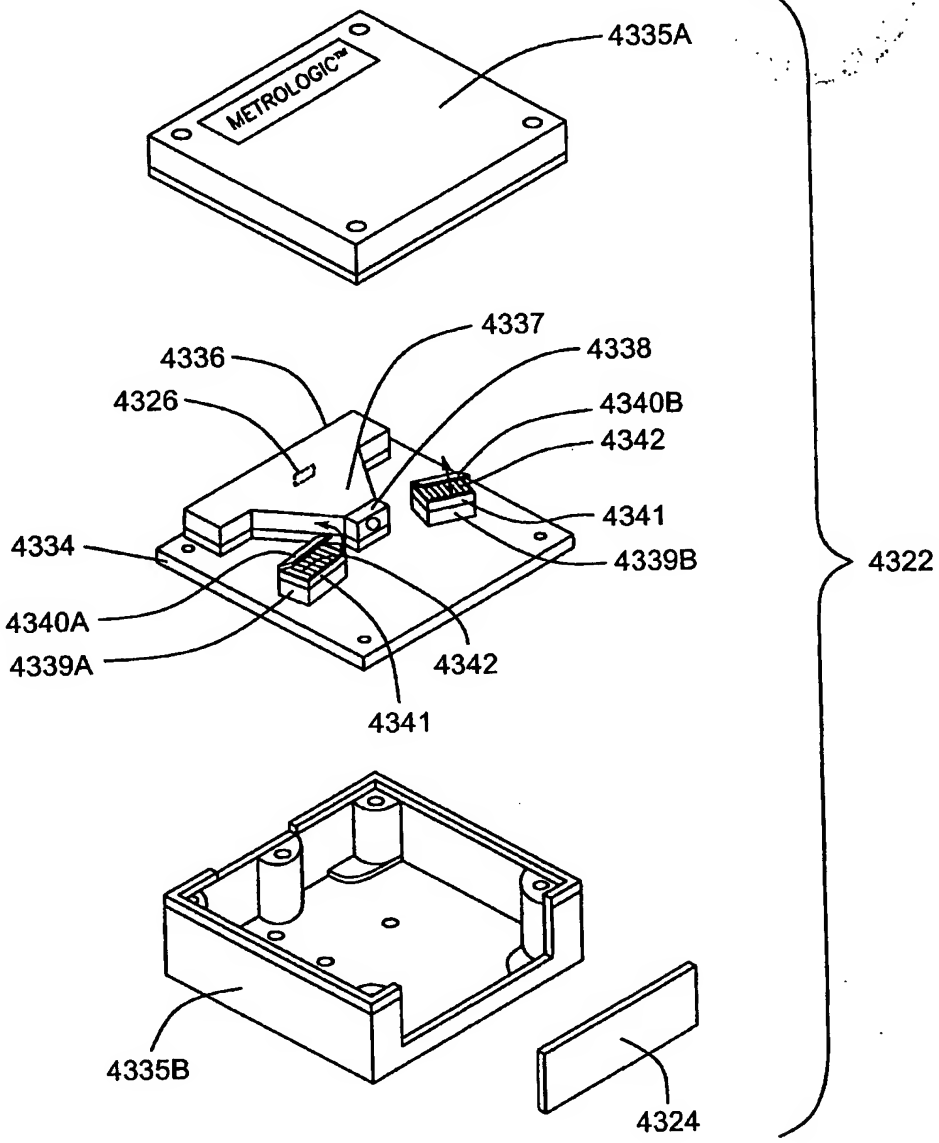


FIG. 62A



Micro-oscillating
Spatial Intensity
Modulation Panels
Fig. 1I21A-21D

FIG. 62B

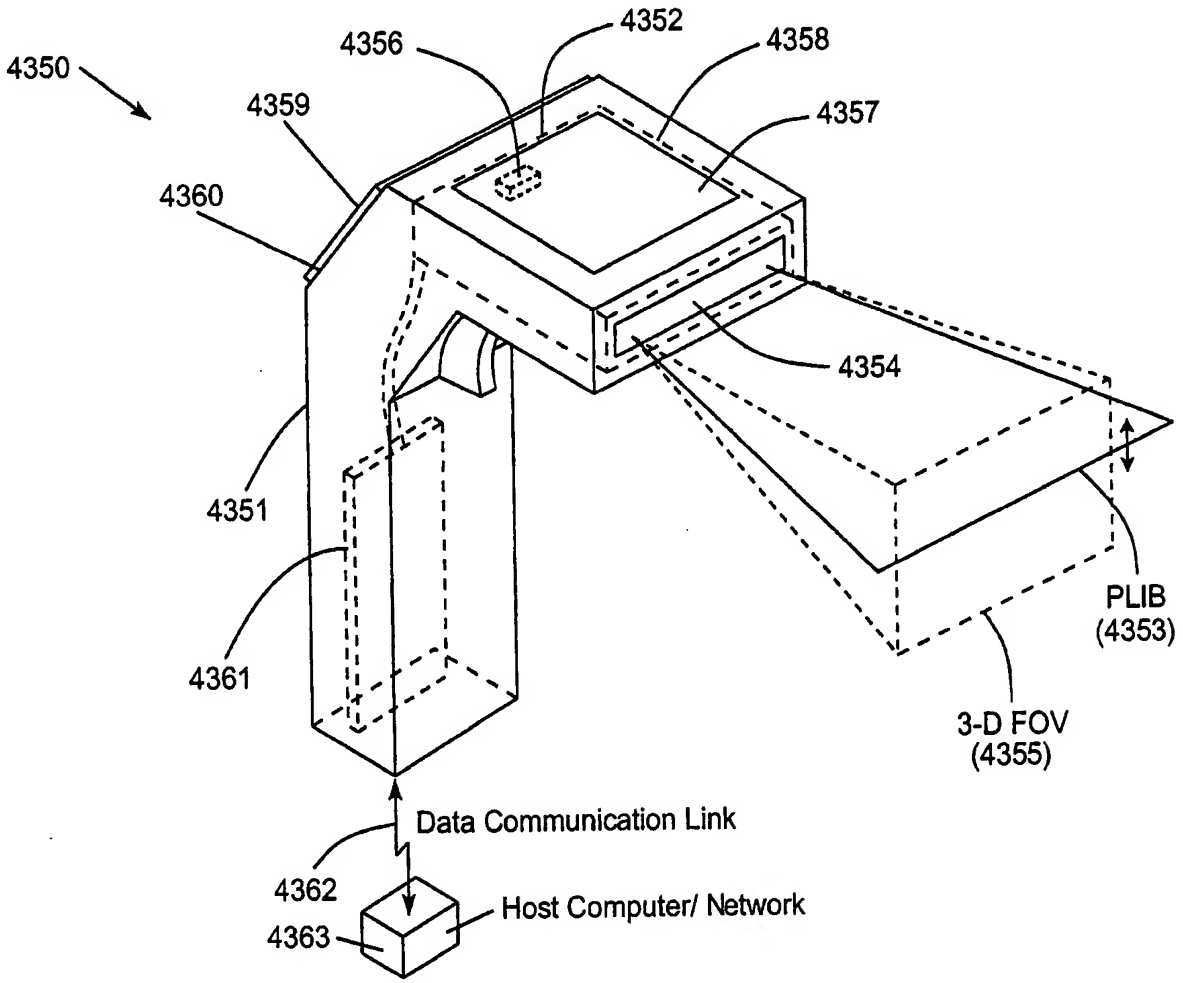
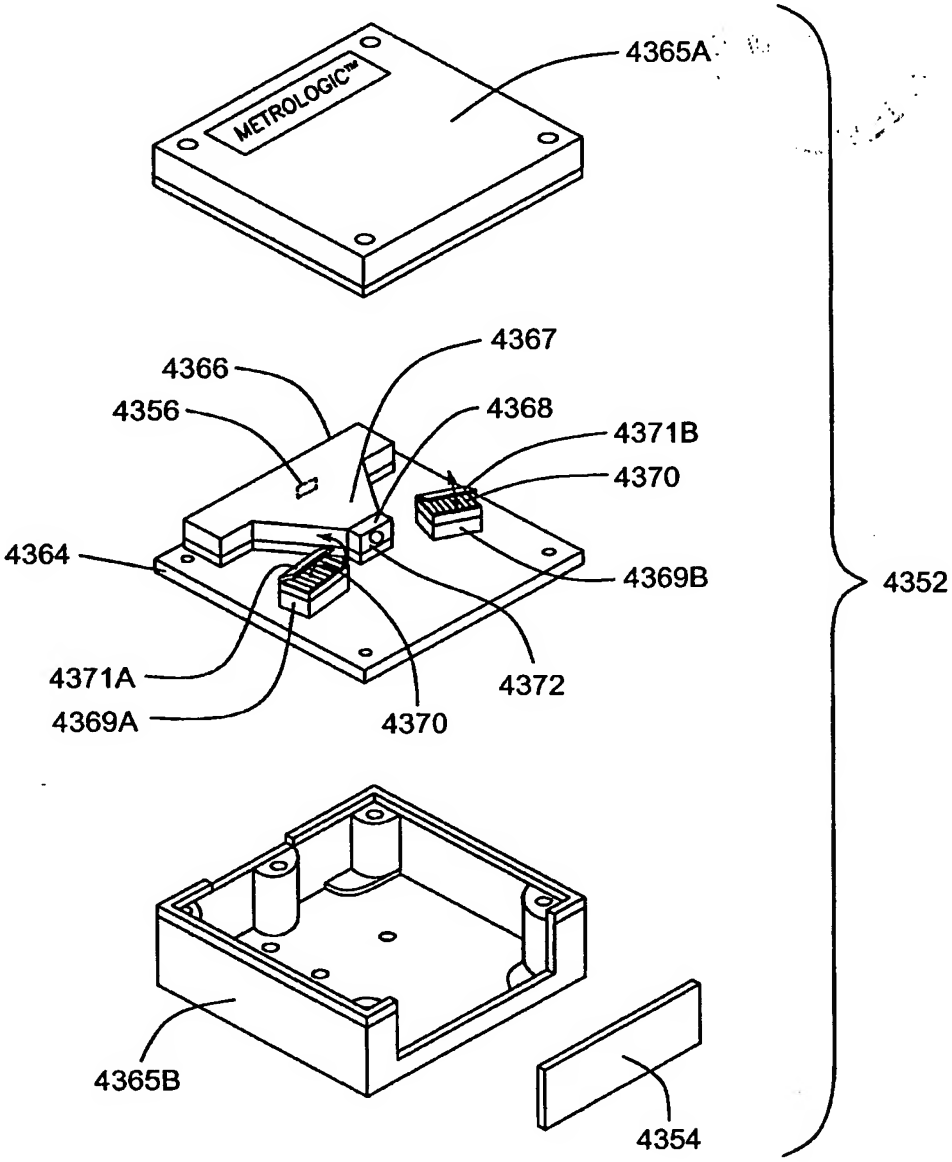

4350
4356
4352
4358
4359
4357
4360
4354
4351
4361
PLIB
(4353)
3-D FOV
(4355)
Data Communication Link
4362
Host Computer/ Network
4363

FIG. 63A



EO or Mechanically Rotating Iris

Fig. 1123A-23B

FIG. 63B

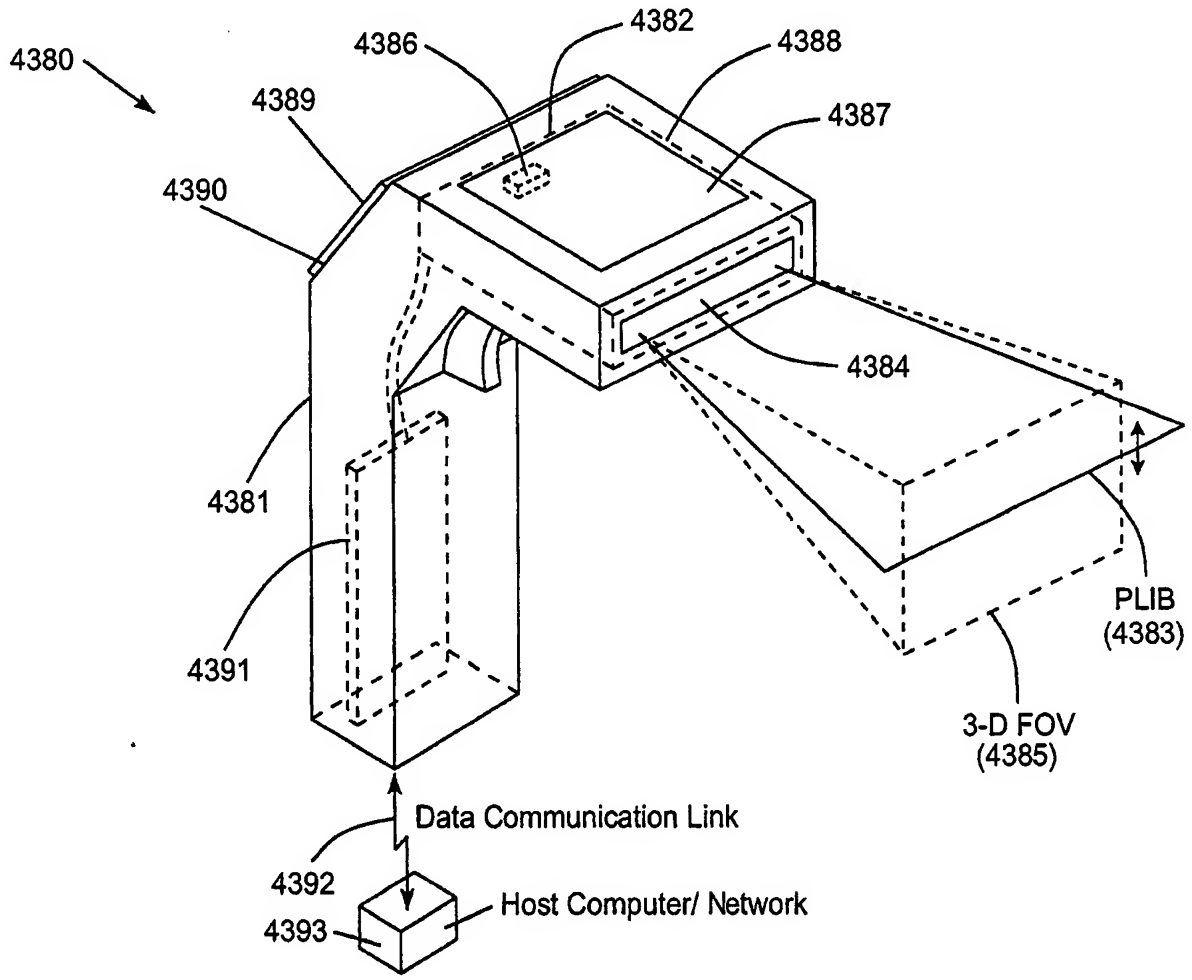
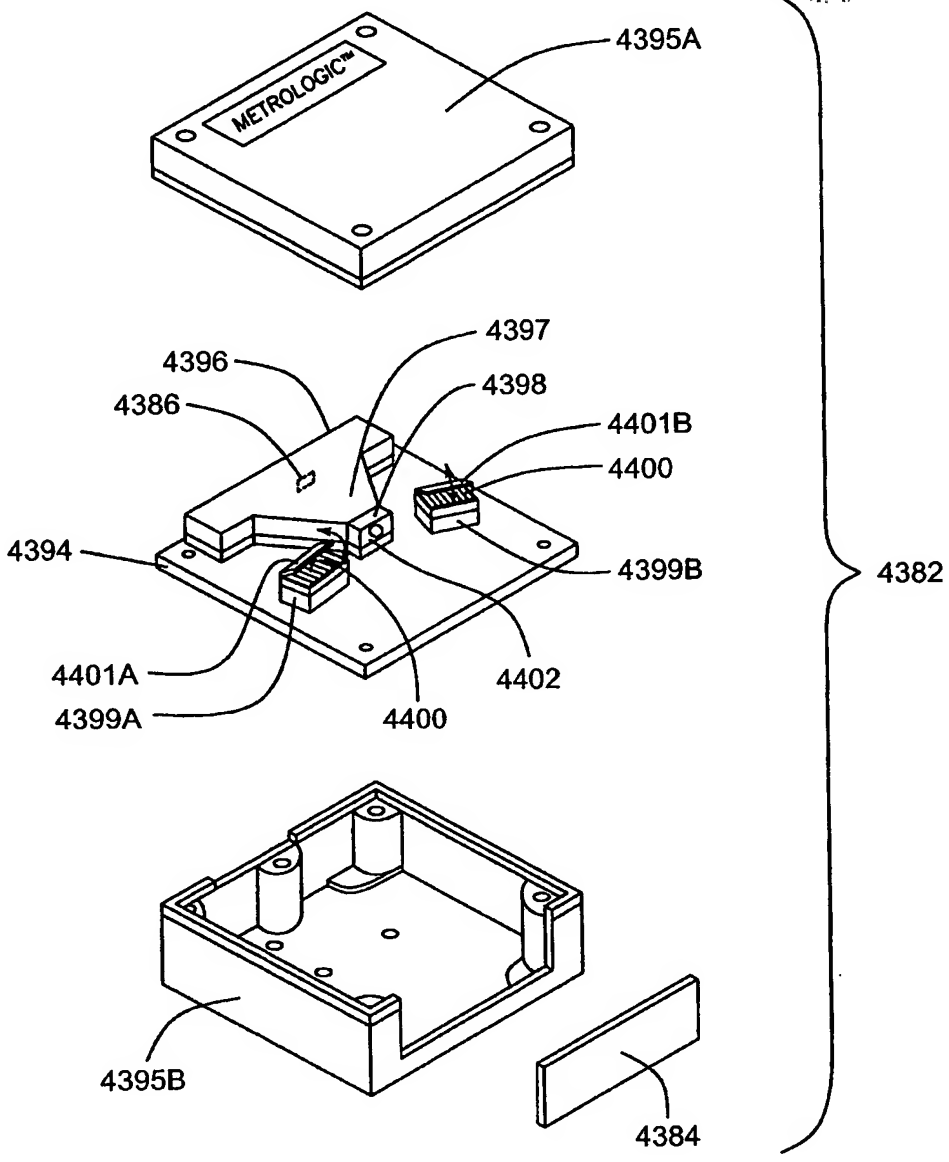


FIG. 64A



E-optical Shutter
Before IFD Lens

Fig. 1I24A

FIG. 64B

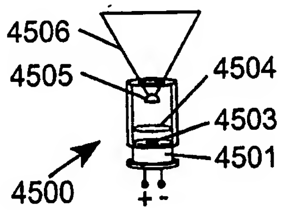


FIG. 65A

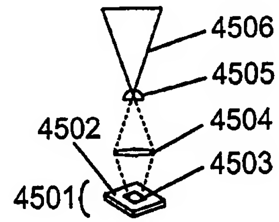


FIG. 65B

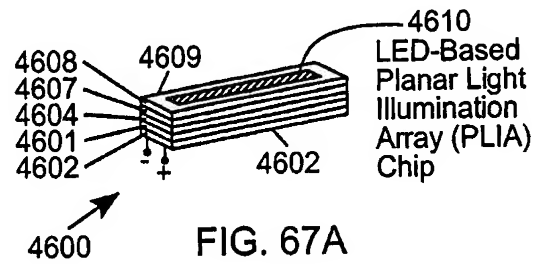


FIG. 67A

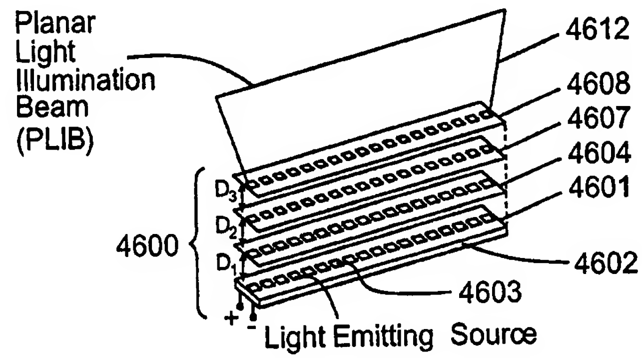


FIG. 67B

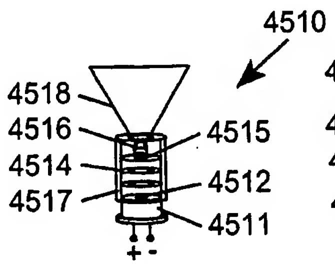


FIG. 66A

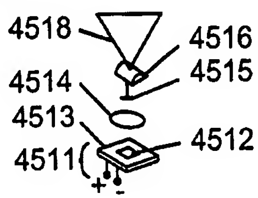


FIG. 66B

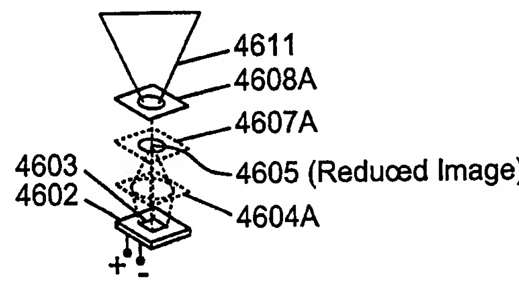


FIG. 67C

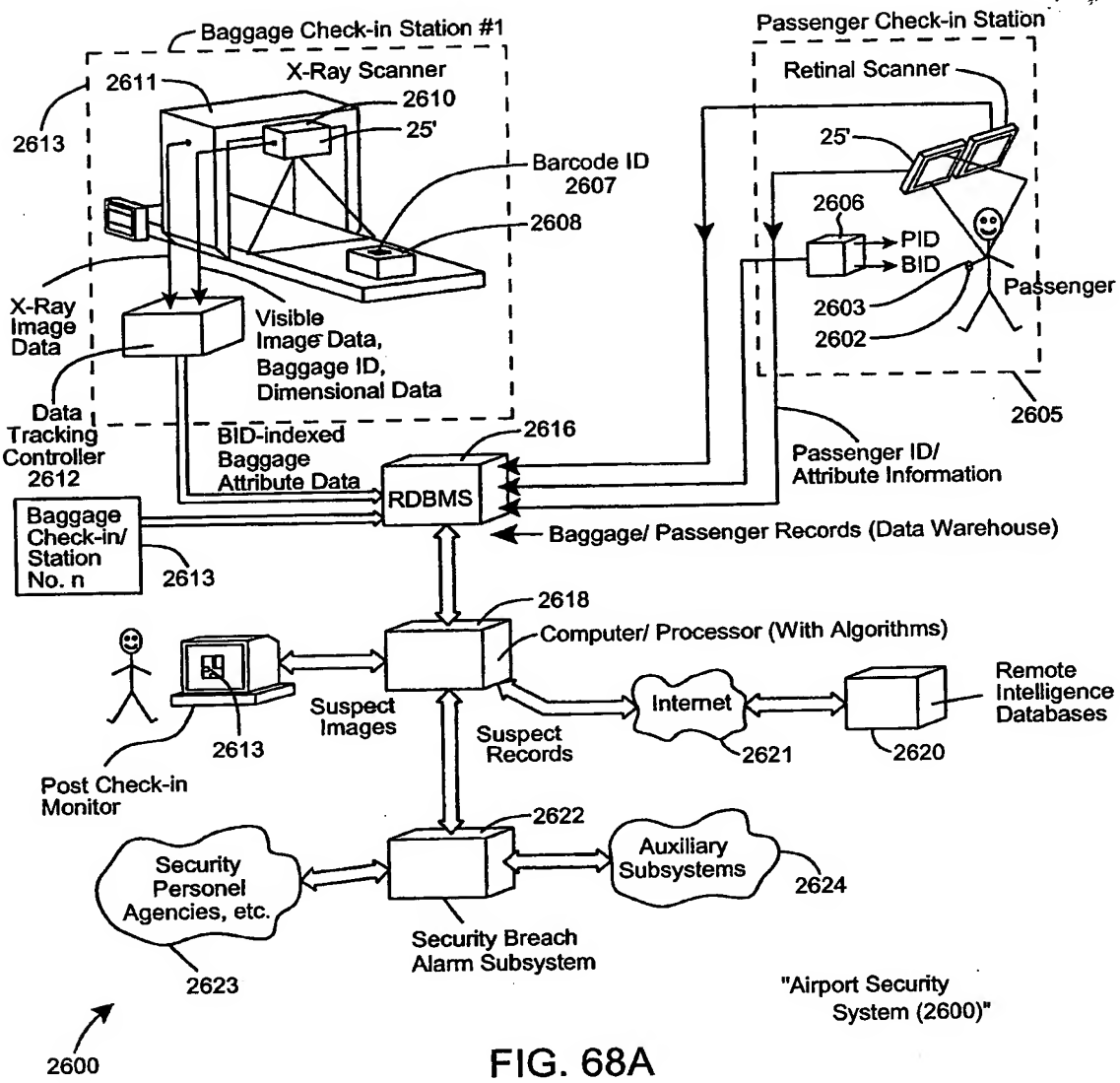


FIG. 68A

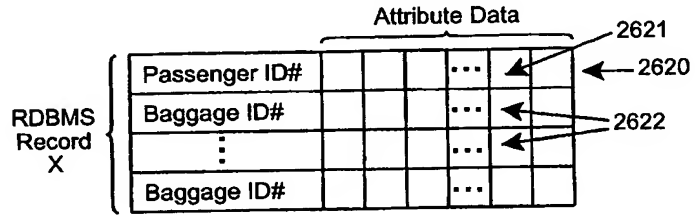


FIG. 68B

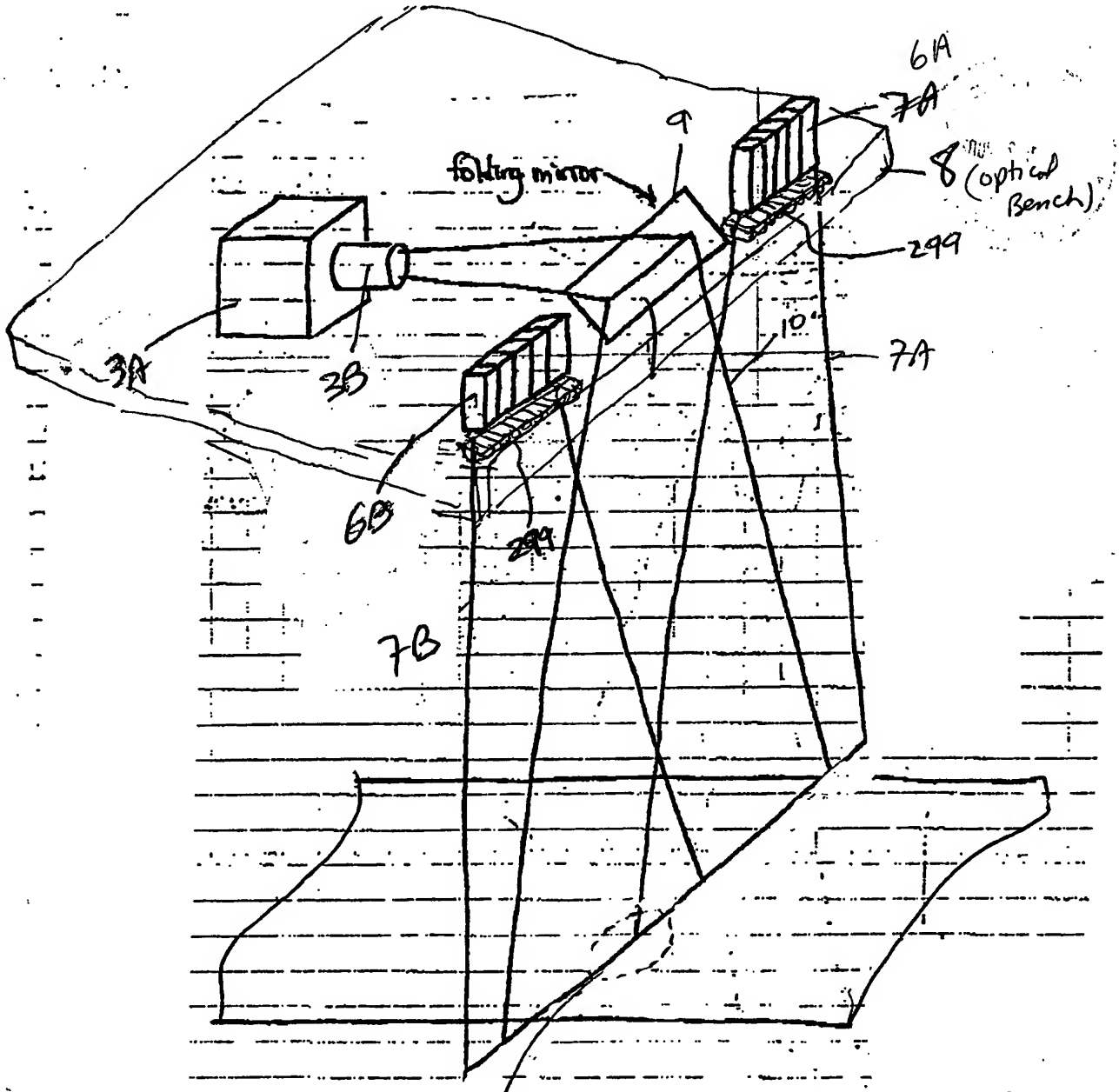


FIG. 1B1

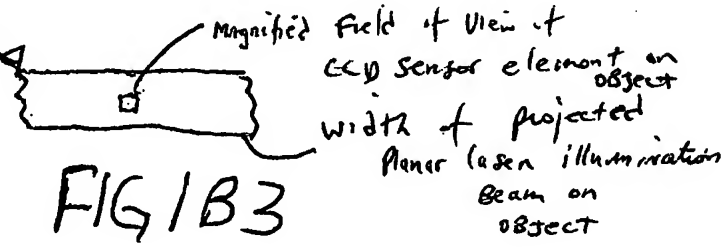


FIG 1B3

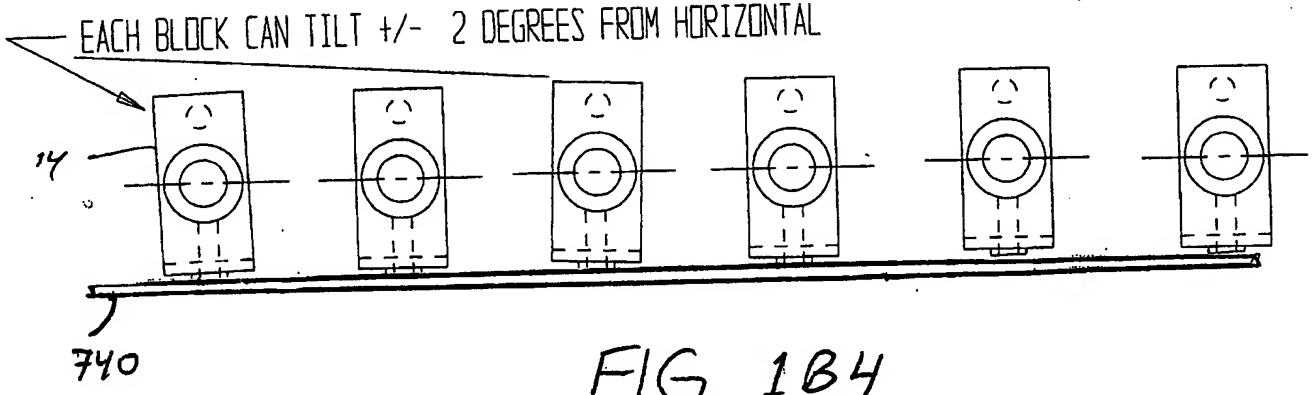


FIG. 1B4

FORWARD
VLD BLOCK CAN PITCH ~~FOWARD~~ FOR ALIGNMENT WITH OTHER VLD BEAMS

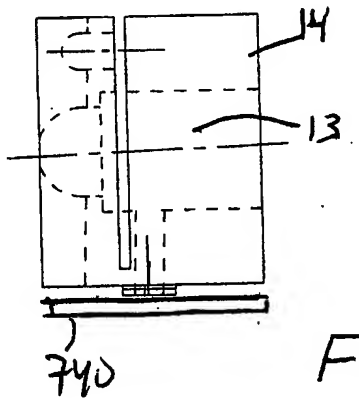


FIG. 1B5

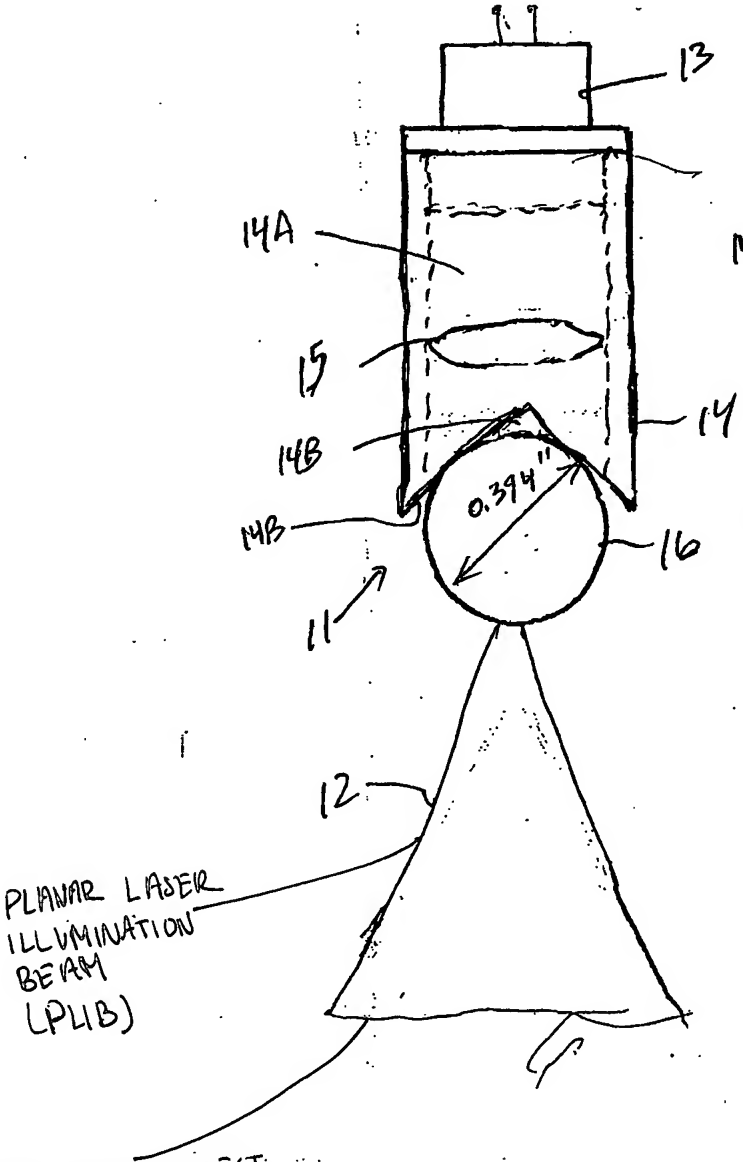


FIG. 16A

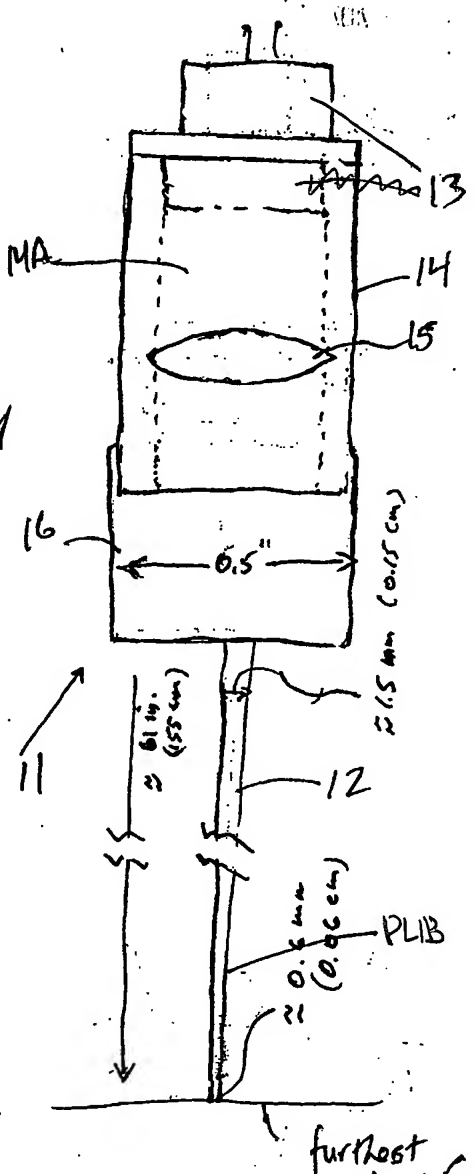


FIG. 16B

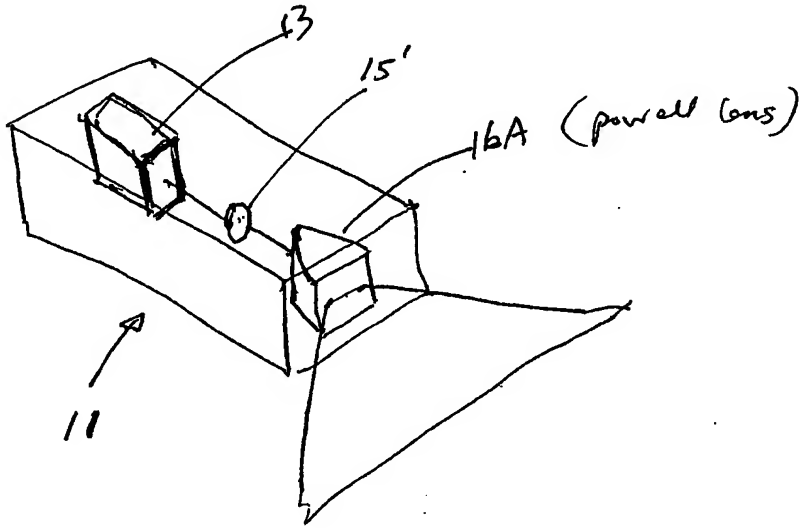


FIG. 1G.16A

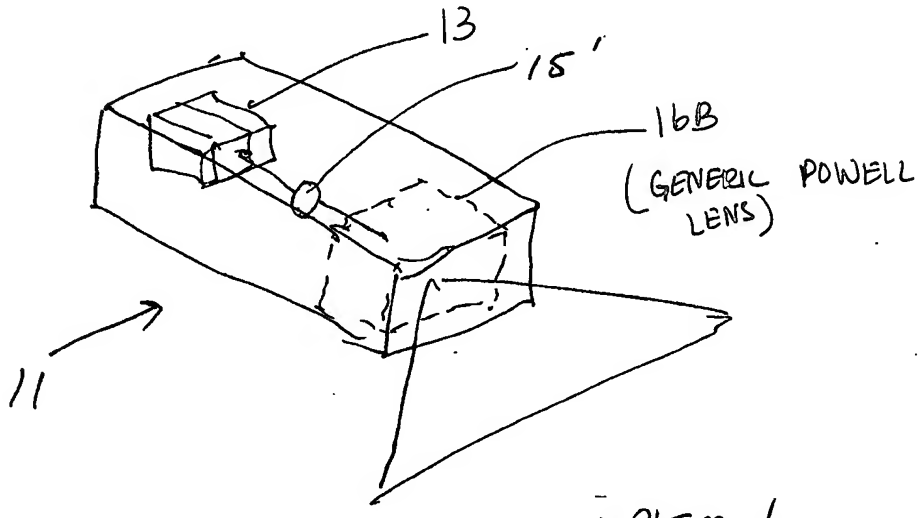


FIG. 1G16B

· PLIM w/ powell lens

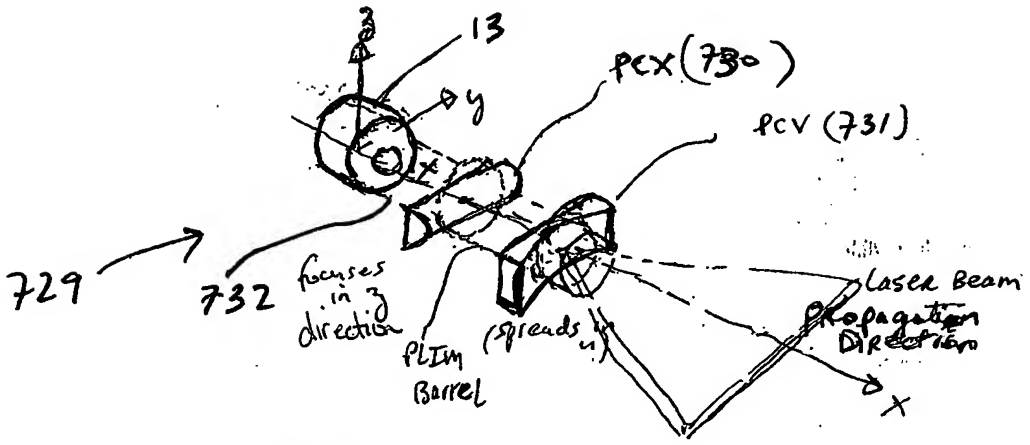


FIG. 16.17A

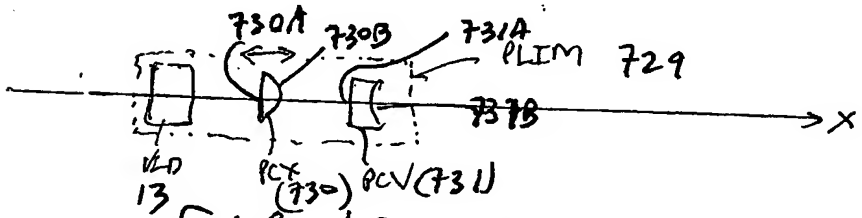


FIG. 16.17B

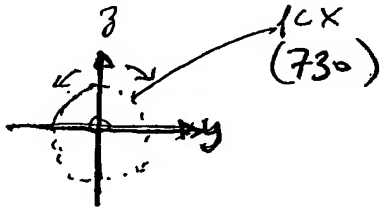


FIG. 16.17C

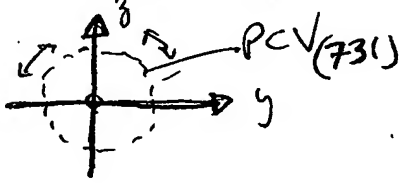


FIG. 16.17D

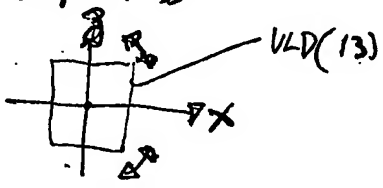


FIG. 16.17E

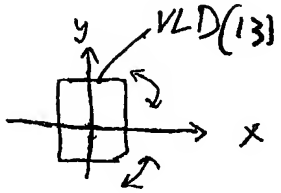


FIG. 16.17F

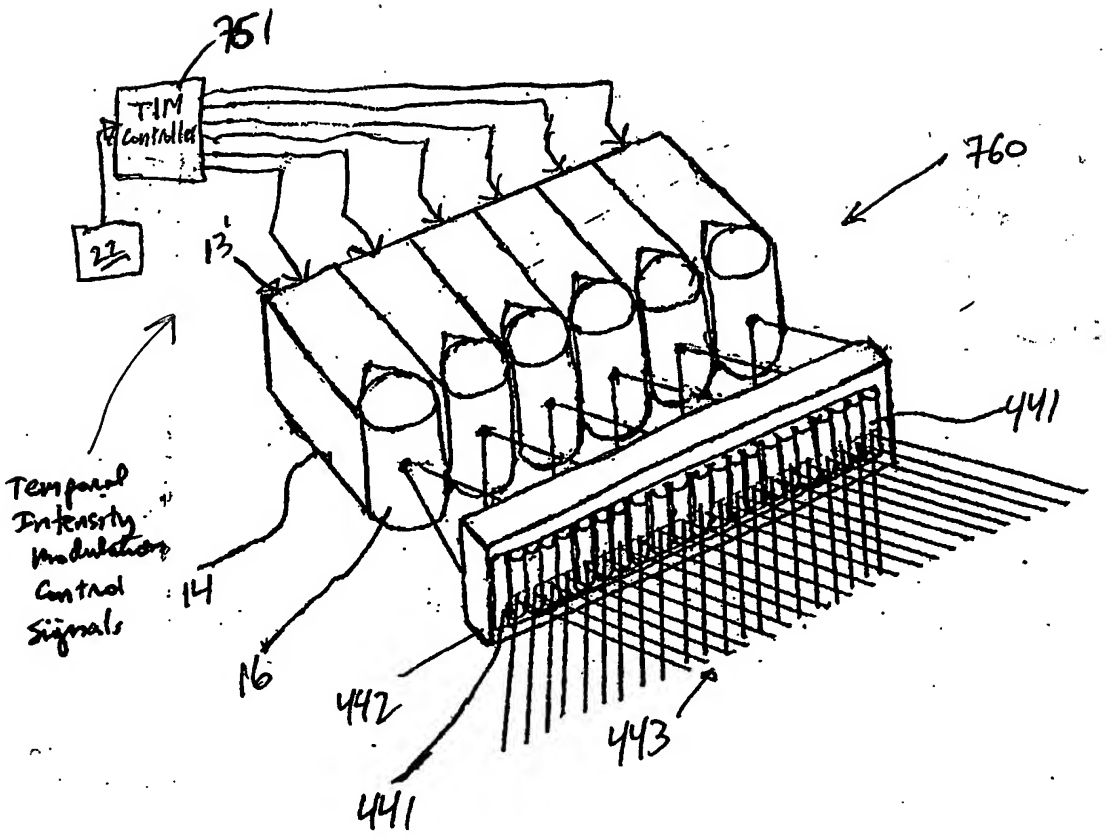


FIG. 1I 15C

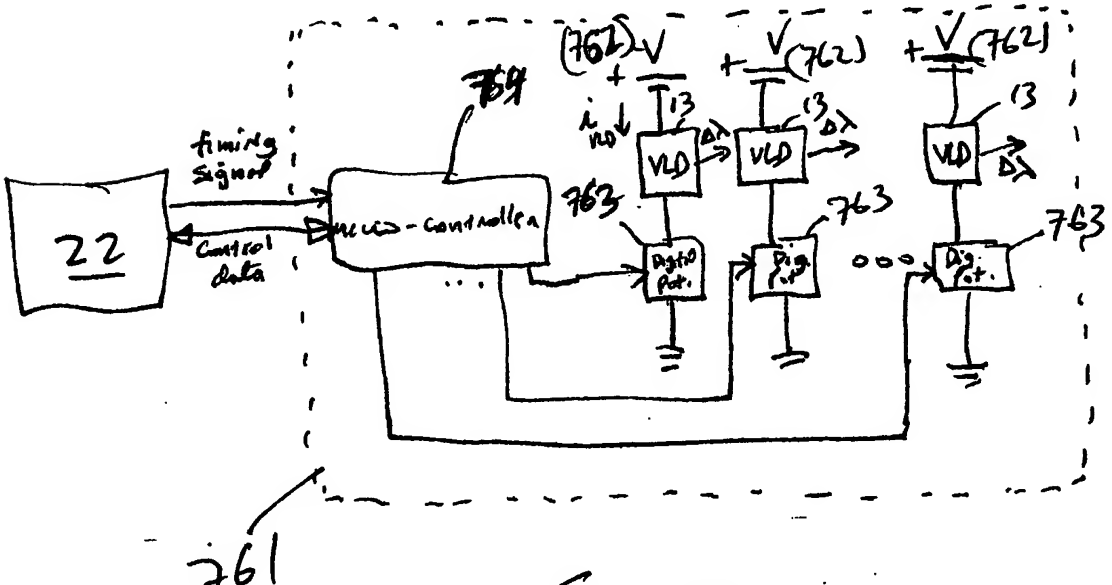


FIG. 1I 15D

Fourth Generalized Method of Reducing Speckle-Noise Patterns at Image Detection Array of the IFD Subsystem (3)

(TFMP)

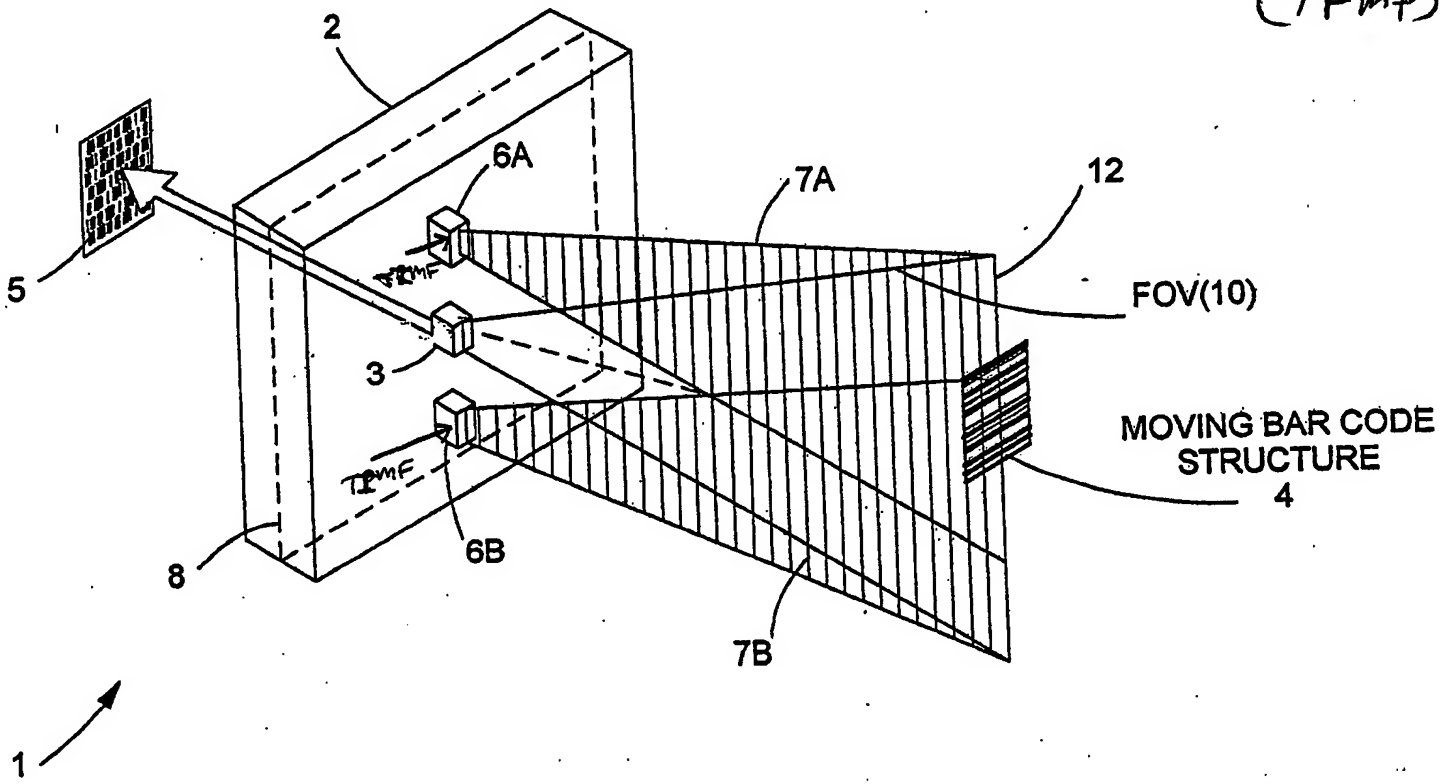


FIG. ~~II 8A~~ 1I18

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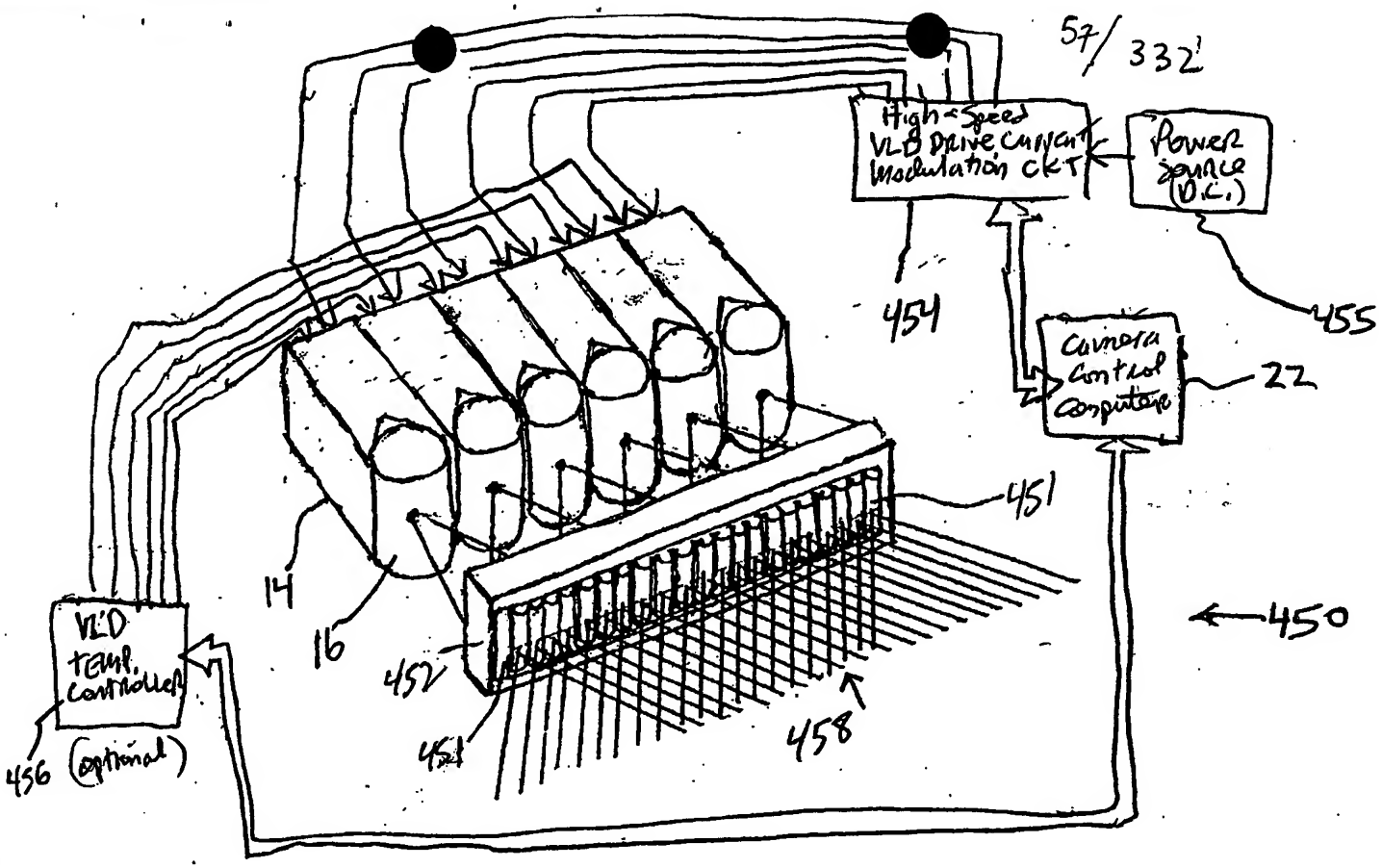


FIG. 1I19A

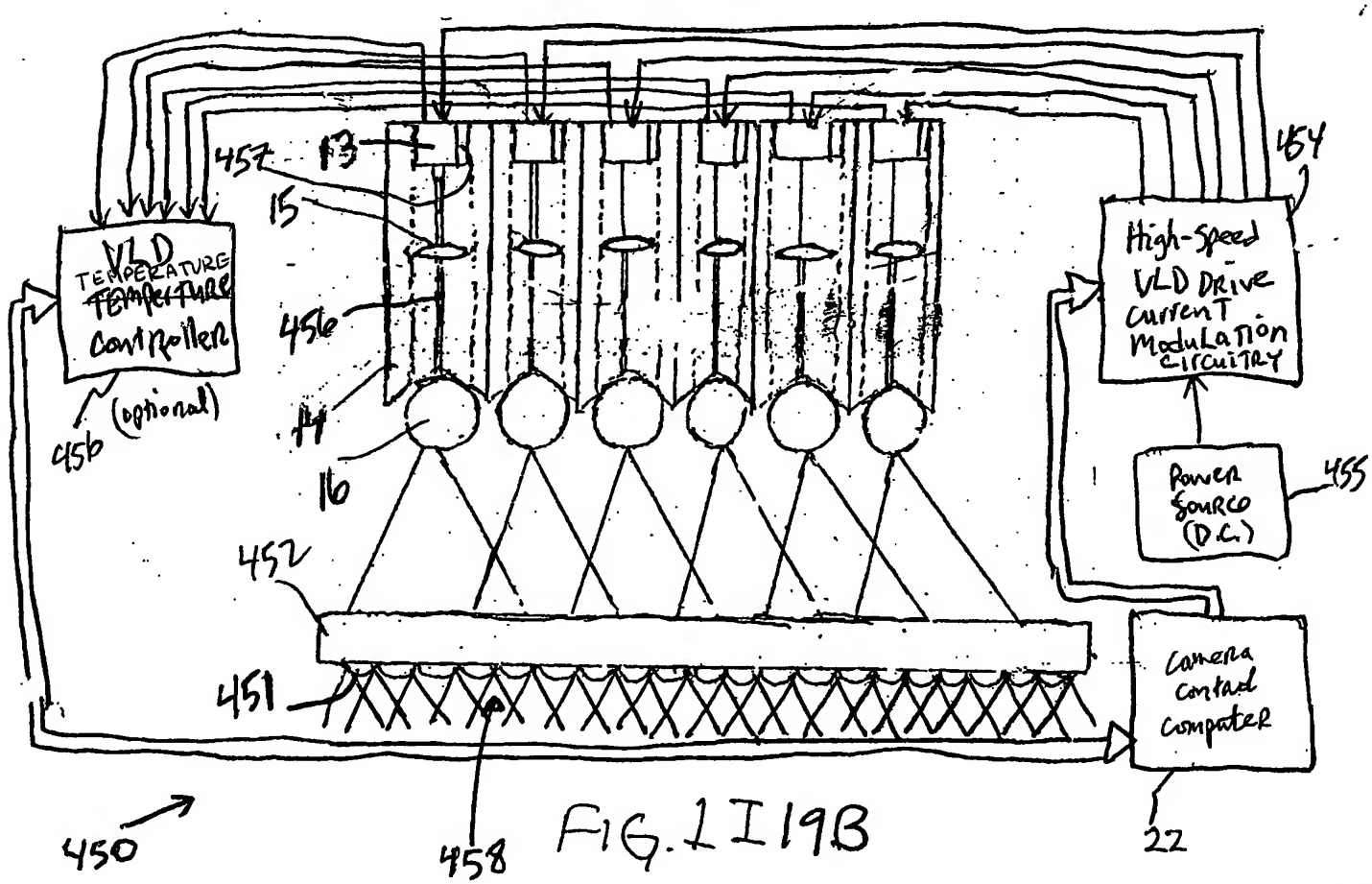
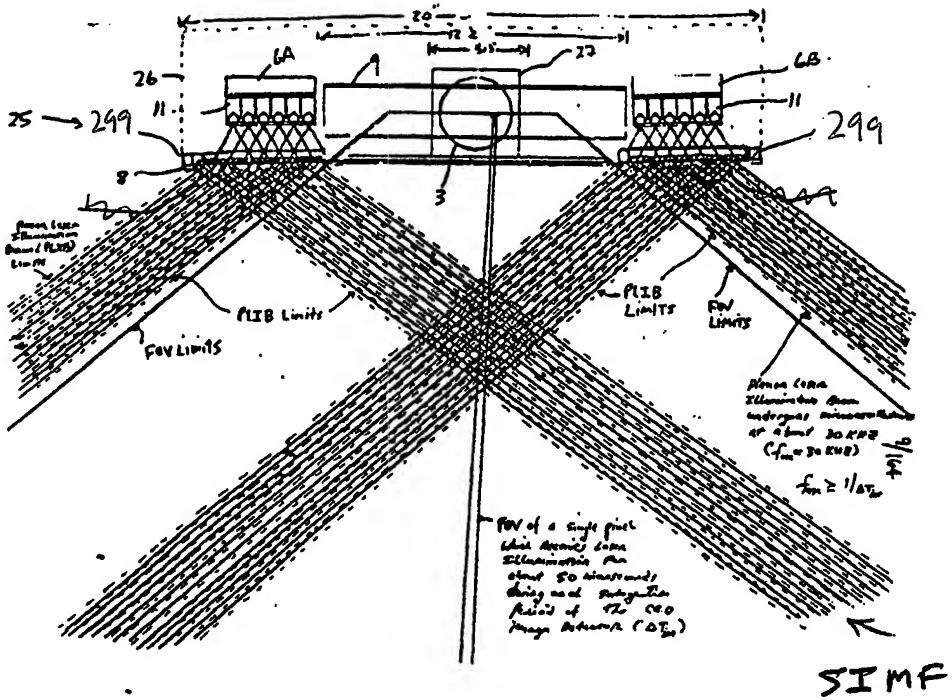


FIG. 1I19B



Prior to object Illumination

FIG. 1I 20A

Sixth Generalized Method of Reducing Speckle-Noise Patterns at Image Detection Array of the IFD Subsystem

(SIMF)

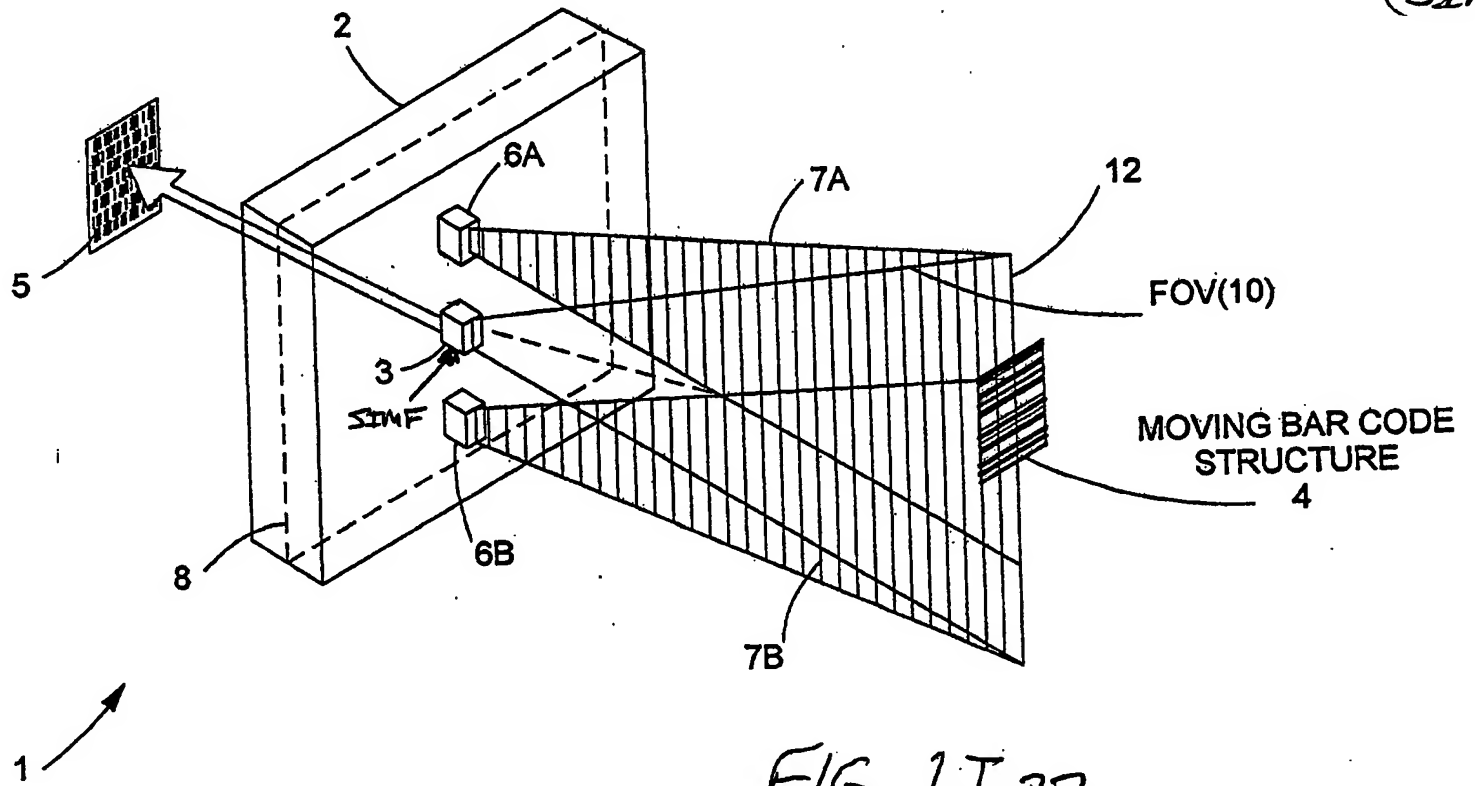


FIG. 1I 22

G3/ 332

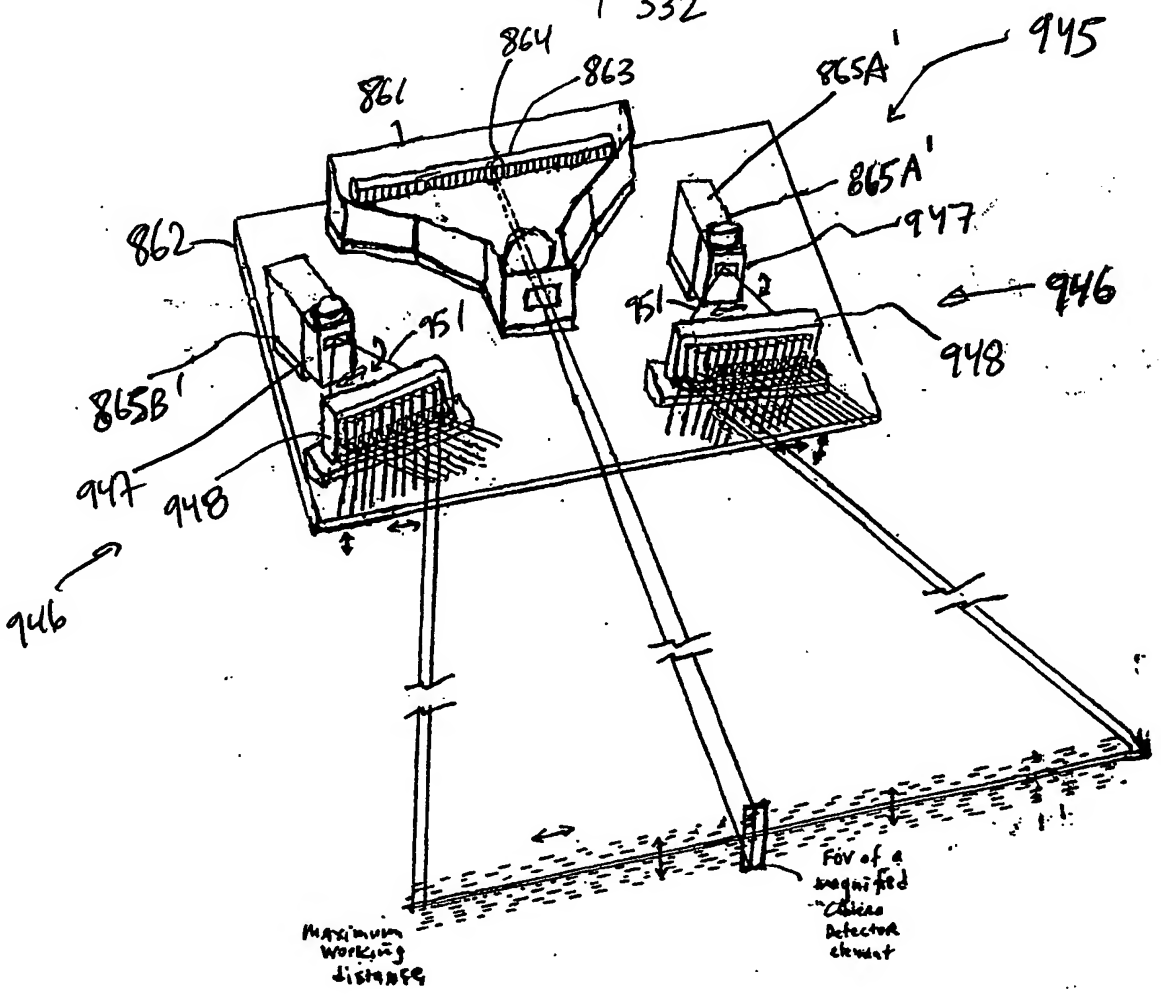


FIG. 1I25I1

Lateral and Transverse Microoscillation of PLIB

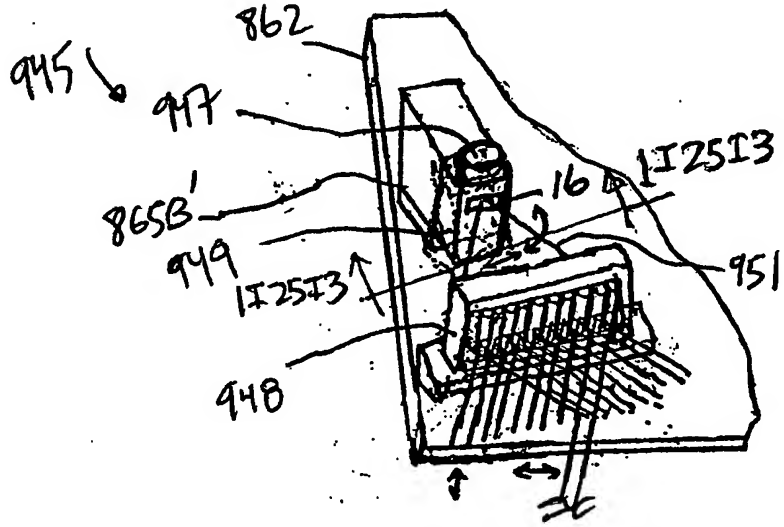


FIG. 1I25I2

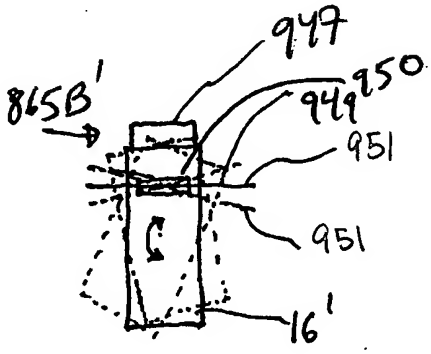


FIG. 1I25I3

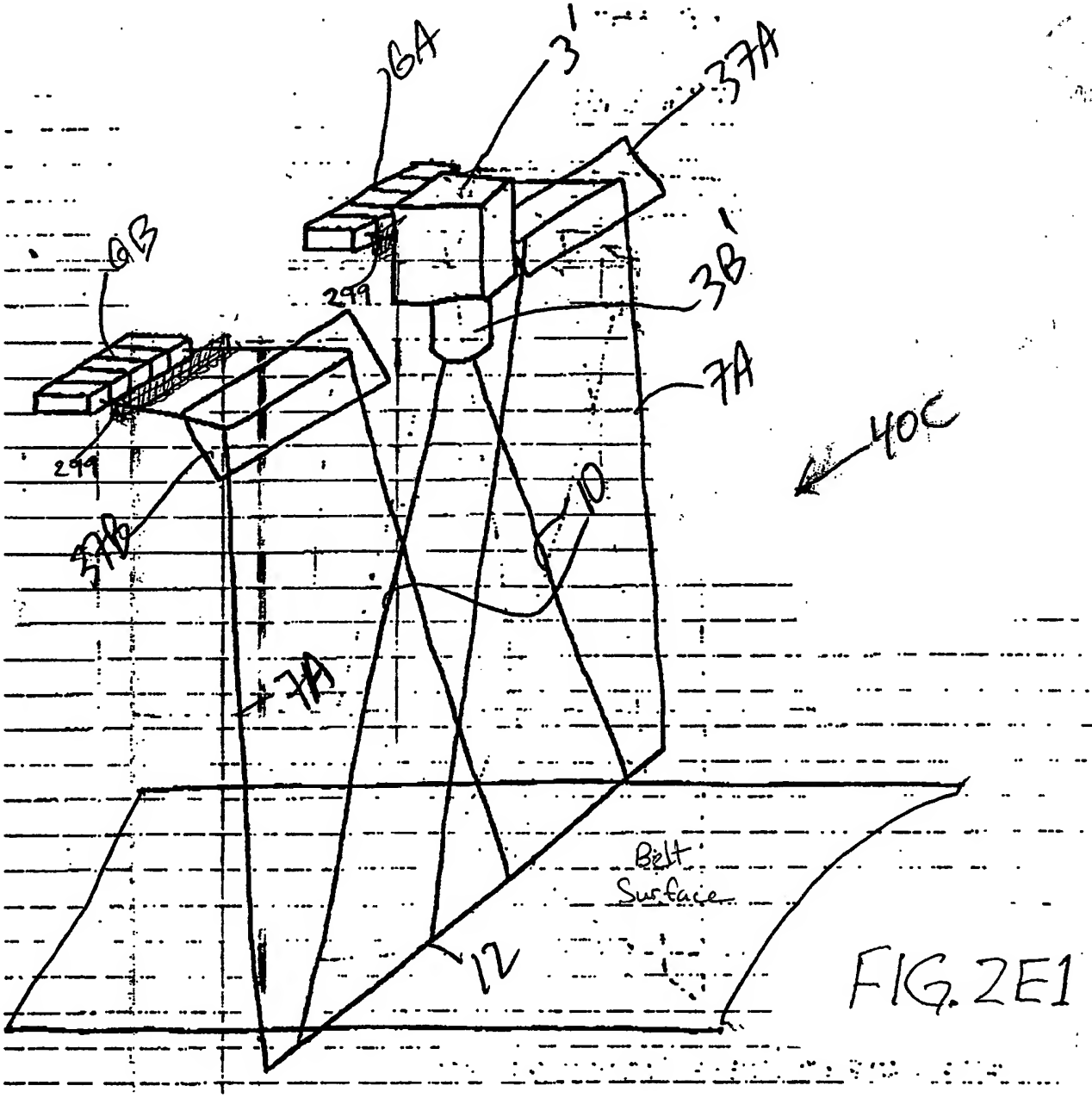


FIG. 2E1

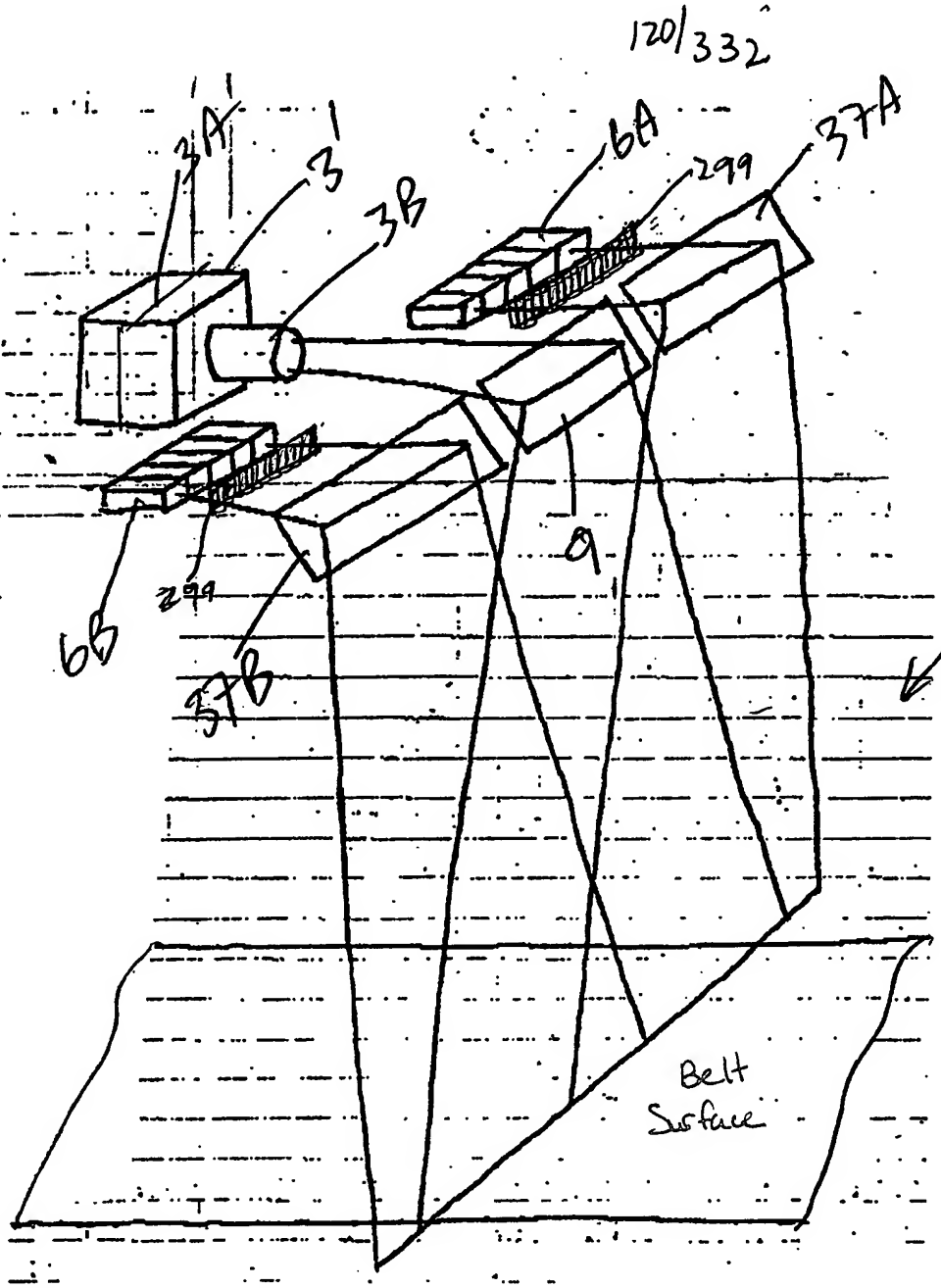


FIG. 2F1

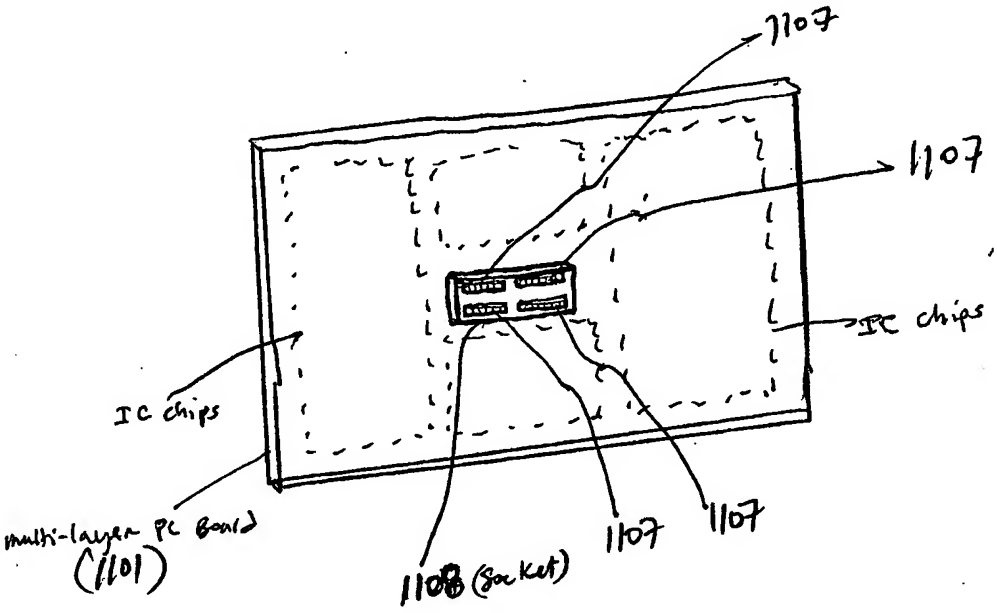


FIG. 3D6

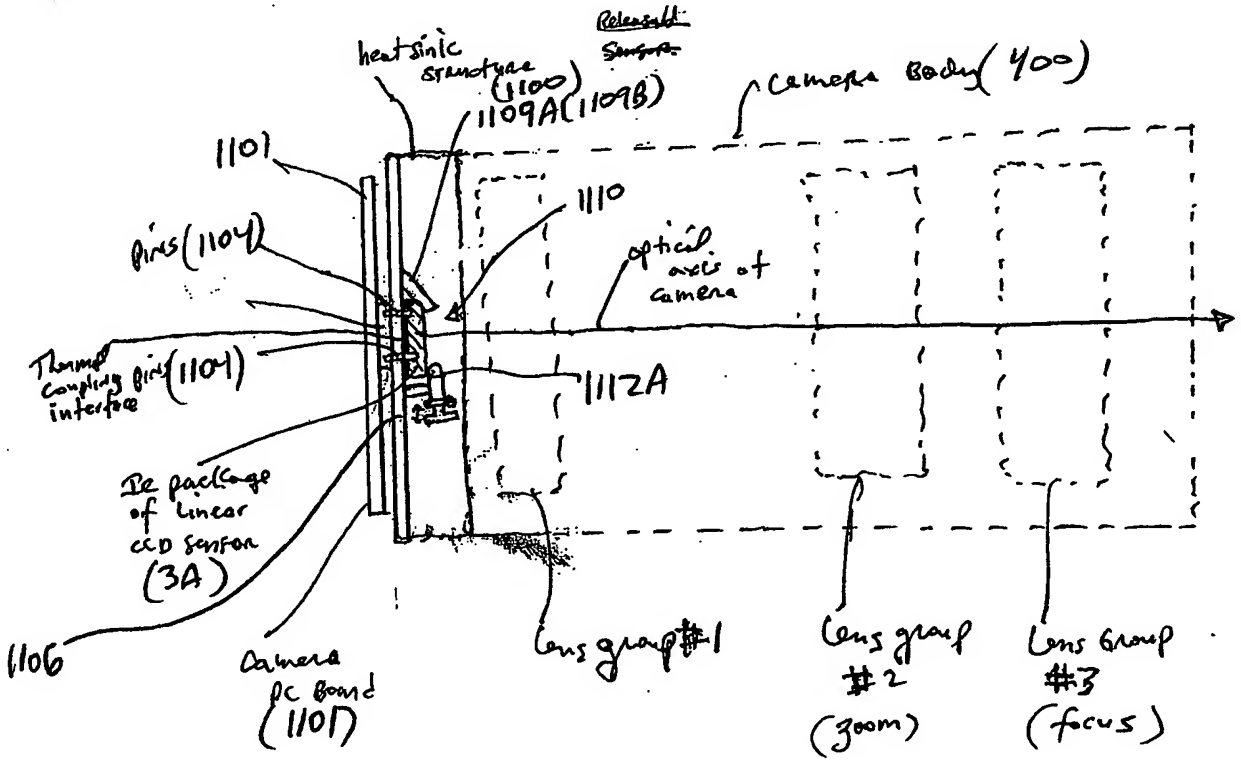


FIG. 3D7

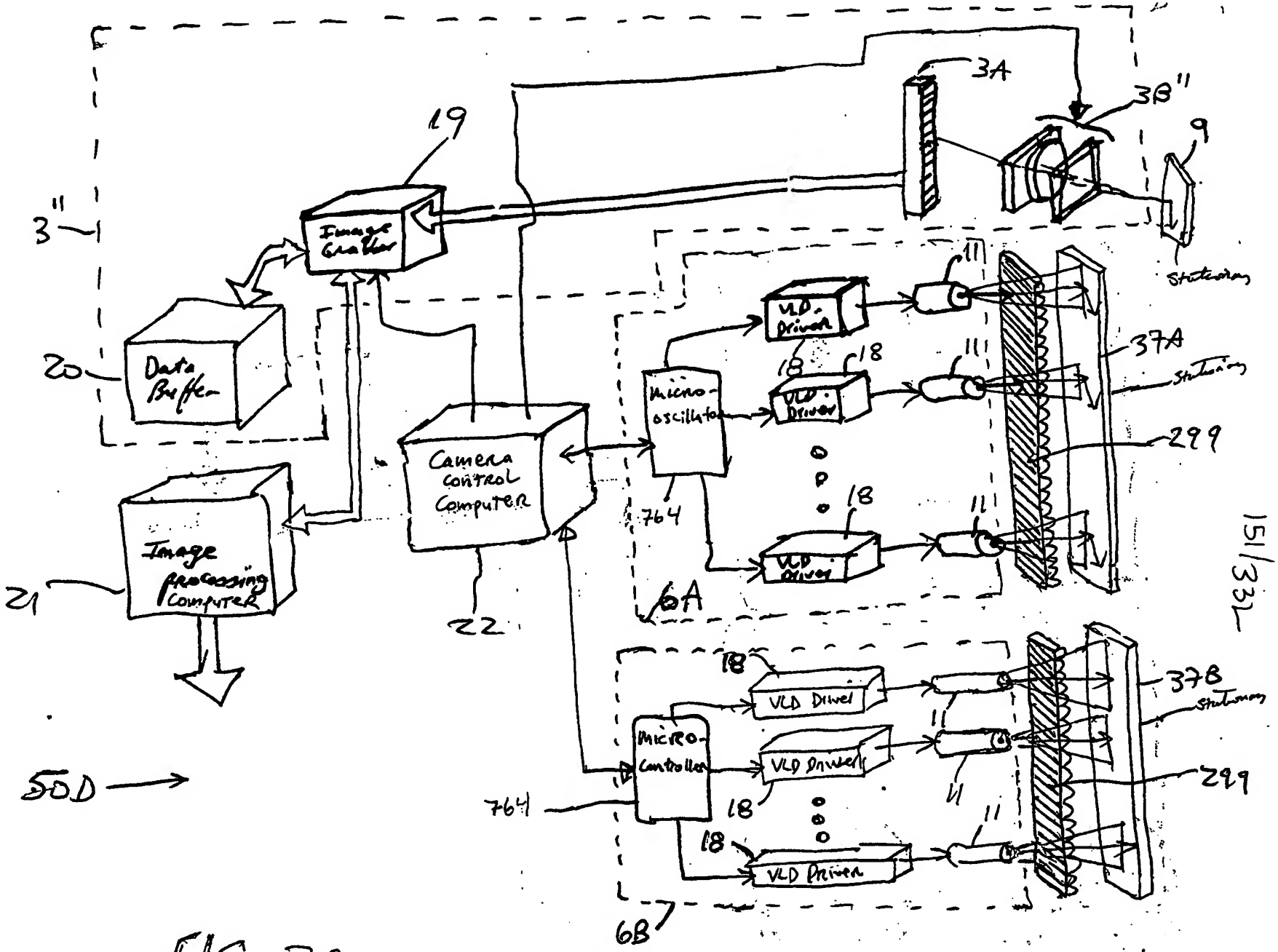

3A
3B"
19
9
3"
Image Grabber
Data Buffer
20
Camera control Computer
Image processing Computer
21
22
VLD Driver
18
11
37A
Micro-oscillator
764
299
6A
151/33L
37B
Micro-controller
6B
50D

FIG. 3G2

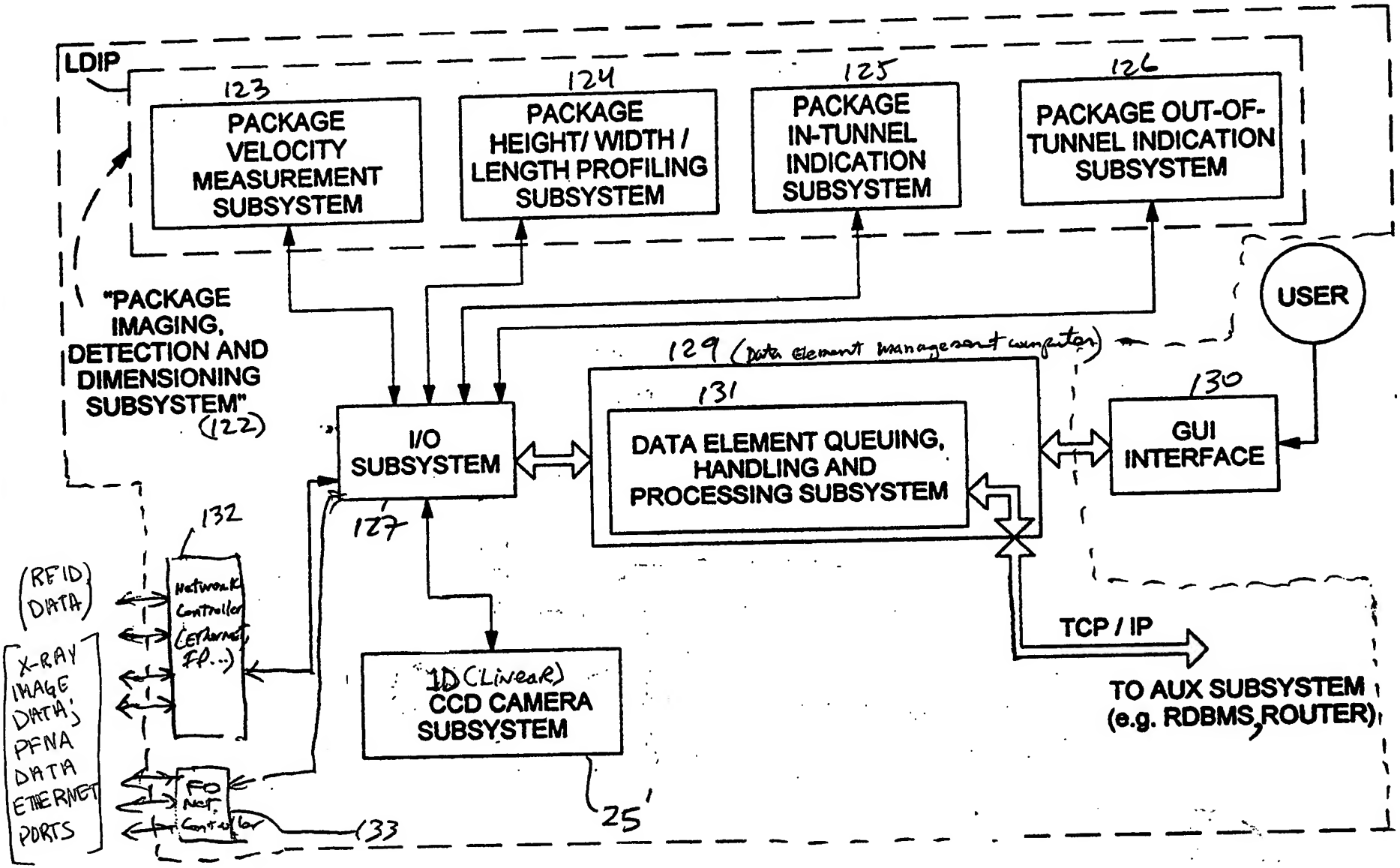

LDIP
123
PACKAGE VELOCITY MEASUREMENT SUBSYSTEM
124
PACKAGE HEIGHT/ WIDTH / LENGTH PROFILING SUBSYSTEM
125
PACKAGE IN-TUNNEL INDICATION SUBSYSTEM
126
PACKAGE OUT-OF-TUNNEL INDICATION SUBSYSTEM
USER
"PACKAGE IMAGING, DETECTION AND DIMENSIONING SUBSYSTEM" (122)
129 (Data Element Management computer)
131
DATA ELEMENT QUEUING, HANDLING AND PROCESSING SUBSYSTEM
130
GUI INTERFACE
I/O SUBSYSTEM
127
132
(RFID DATA)
X-RAY IMAGE DATA, PFNA DATA ETHERNET PORTS
Network Controller (Ethernet, FP...)
FO Net. Controller
133
1D (Linear) CCD CAMERA SUBSYSTEM
25
TCP / IP
TO AUX SUBSYSTEM (e.g. RDBMS, ROUTER)
201/332
120

FIG. 10

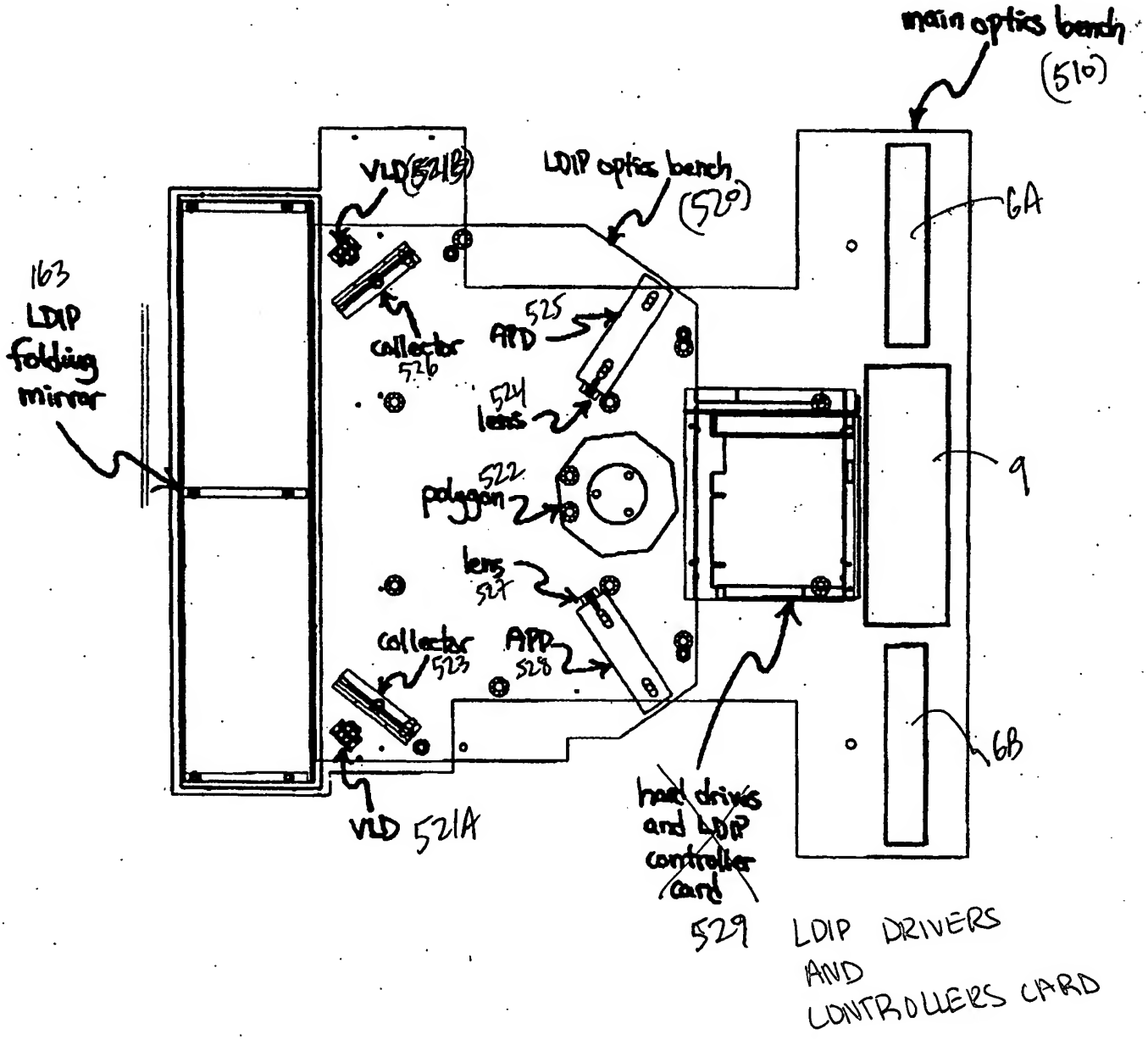

main optics bench
(510)
VLD (521B)
LDIP optics bench
(520)
6A
163
LDIP
folding
mirror
collector
526
APD
525
524
lens
polygon
522
9
lens
527
collector
523
APD
528
6B
VLD 521A
heat drives
and LDIP
controller
card
529
LDIP DRIVERS
AND
CONTROLLERS CARD

FIG. 12D

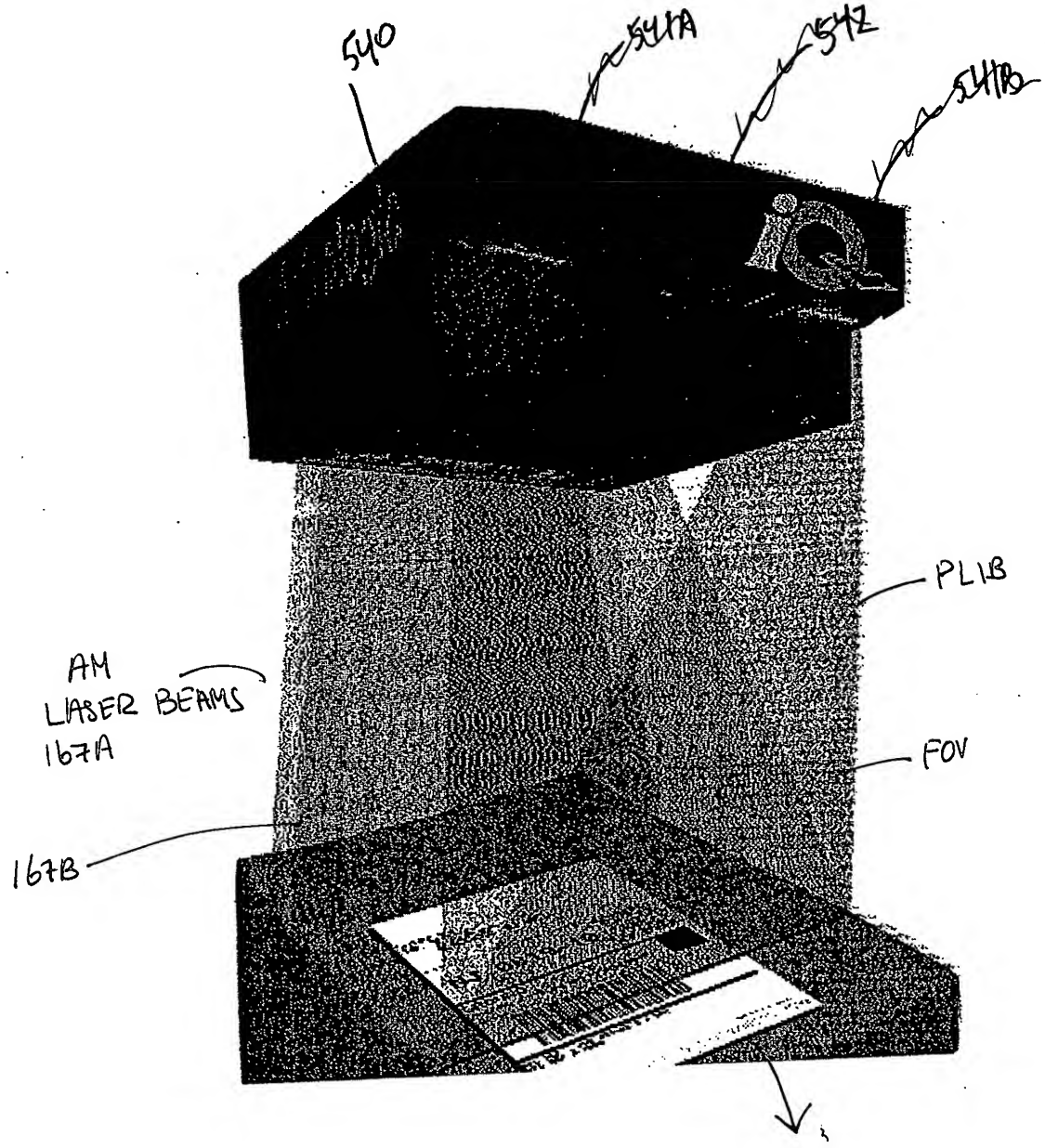


FIG. 13A

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SYSTEM OF THE PRESENT INVENTION

CAMERA CONTROL PROCESS CARRIED OUT WITHIN THE CAMERA CONTROL SUBSYSTEM OF EACH OBJECT ATTRIBUTE ACQUISITION ~~AND ANALYSIS SYSTEM~~ (IDENTIFICATION AND

560

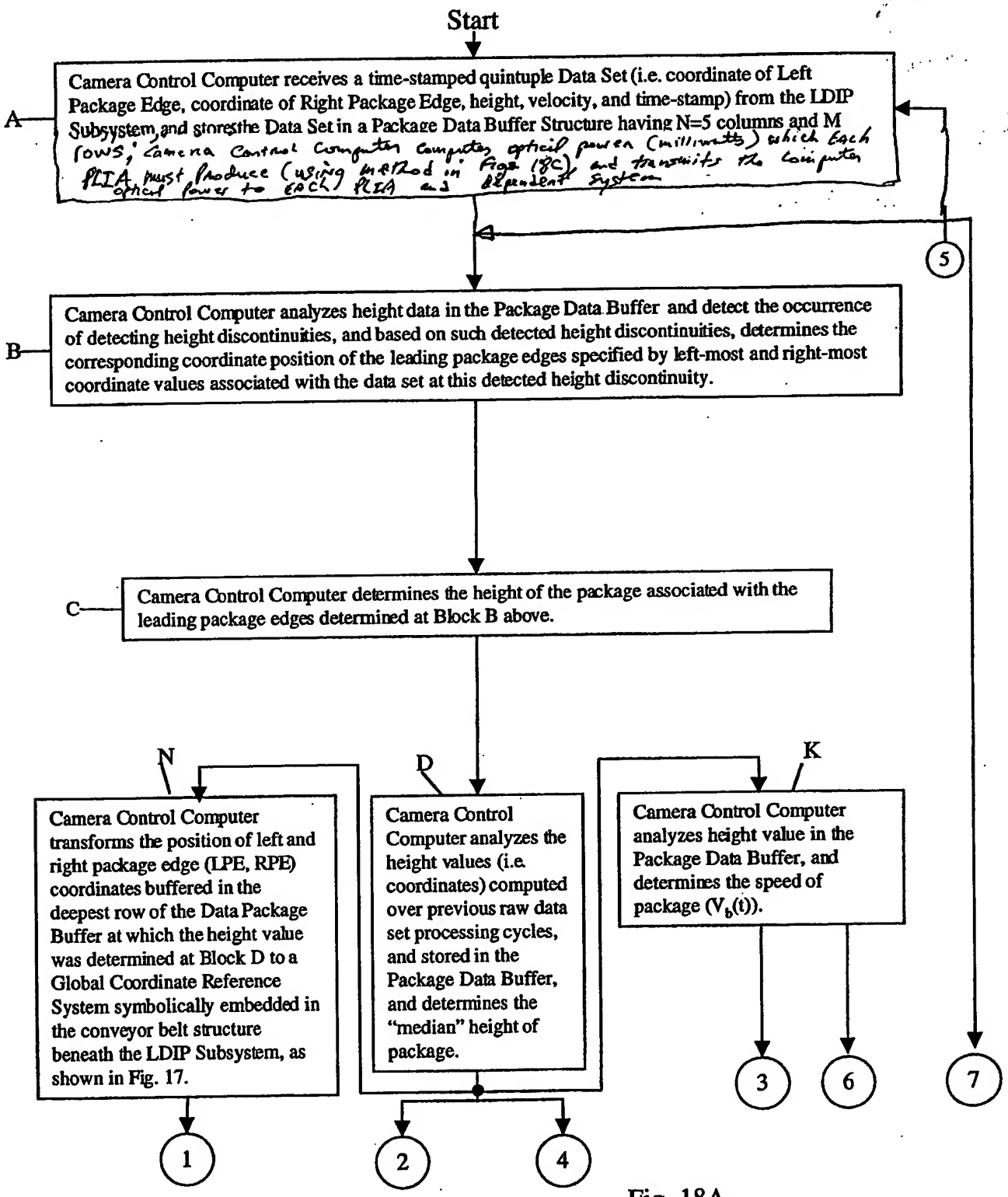


Fig. 18A

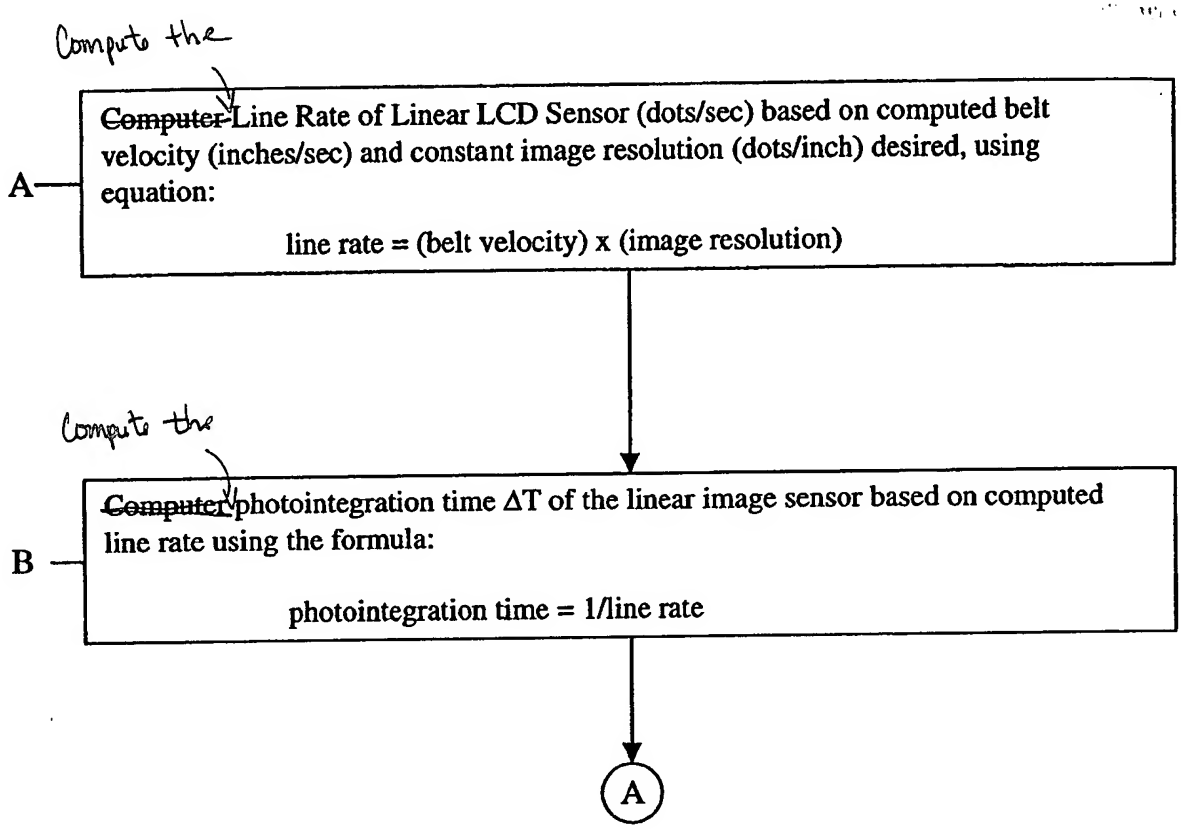

Compute the
~~Computer~~ Line Rate of Linear LCD Sensor (dots/sec) based on computed belt velocity (inches/sec) and constant image resolution (dots/inch) desired, using equation:
line rate = (belt velocity) x (image resolution)
A
Compute the
~~Computer~~ photointegration time ΔT of the linear image sensor based on computed line rate using the formula:
photointegration time = 1/line rate
B
A

Fig. 18C1

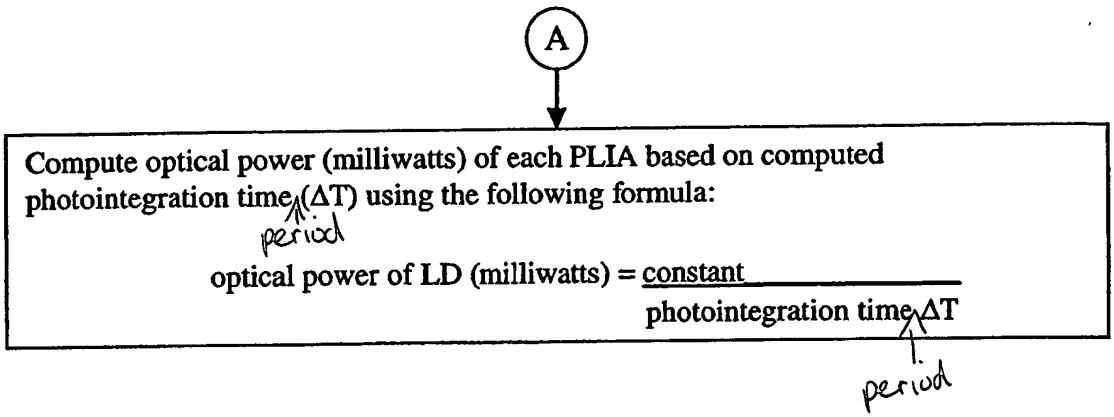

A
Compute optical power (milliwatts) of each PLIA based on computed photointegration time (ΔT) using the following formula:
period
optical power of LD (milliwatts) = constant / photointegration time ΔT
period

Fig. 18C2

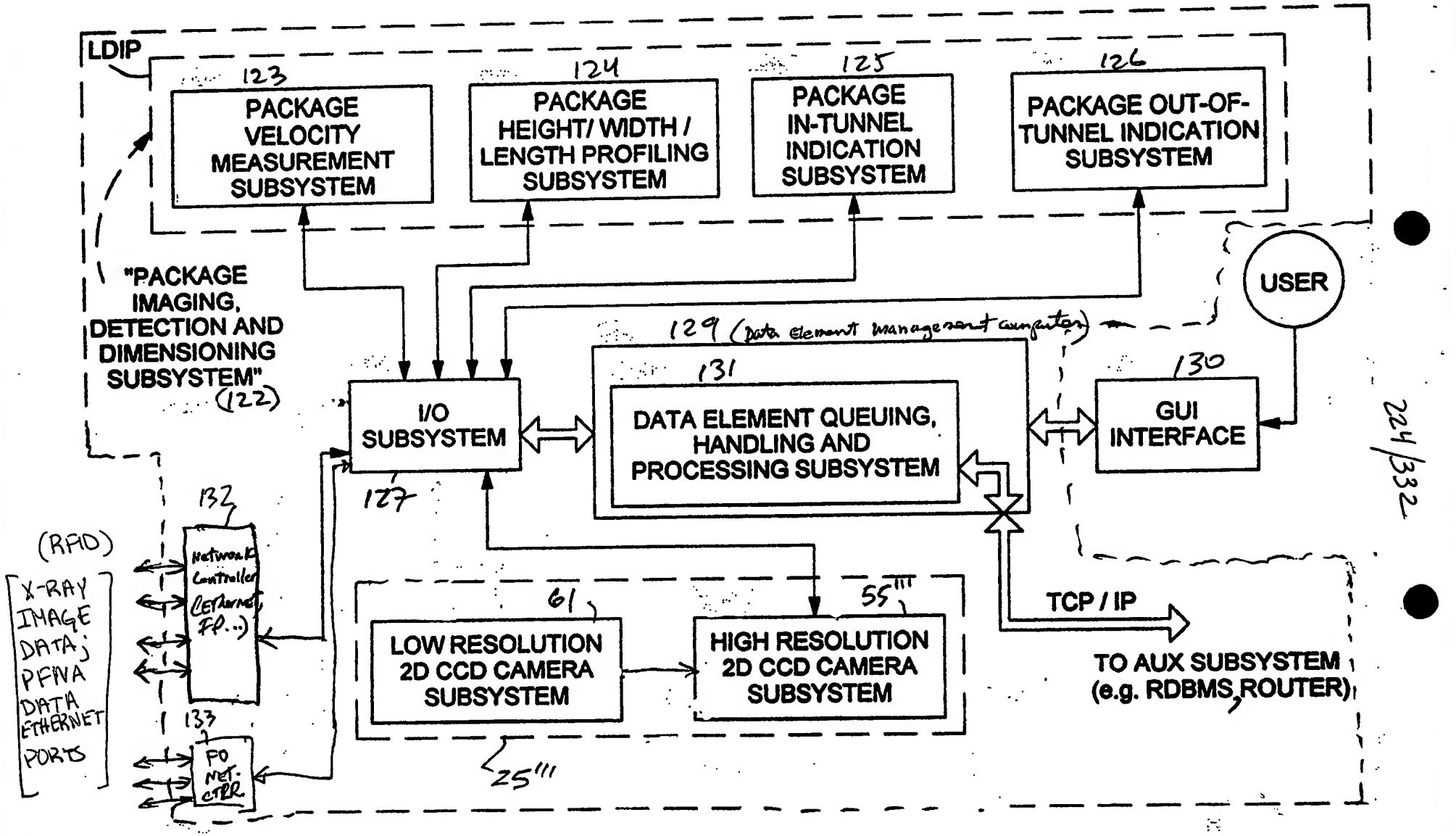

LDIP
123
PACKAGE VELOCITY MEASUREMENT SUBSYSTEM
124
PACKAGE HEIGHT/ WIDTH / LENGTH PROFILING SUBSYSTEM
125
PACKAGE IN-TUNNEL INDICATION SUBSYSTEM
126
PACKAGE OUT-OF-TUNNEL INDICATION SUBSYSTEM
"PACKAGE IMAGING, DETECTION AND DIMENSIONING SUBSYSTEM" (122)
USER
129 (Data Element management computer)
131
DATA ELEMENT QUEUING, HANDLING AND PROCESSING SUBSYSTEM
130
GUI INTERFACE
I/O SUBSYSTEM
127
224/332
132
(RFID)
X-RAY IMAGE DATA; PFNA DATA ETHERNET PORTS
Network Controller (Ethernet, FP...)
133
FO NET-CTER
61
LOW RESOLUTION 2D CCD CAMERA SUBSYSTEM
55'''
HIGH RESOLUTION 2D CCD CAMERA SUBSYSTEM
25'''
TCP / IP
TO AUX SUBSYSTEM (e.g. RDBMS, ROUTER)
140

FIG. 25

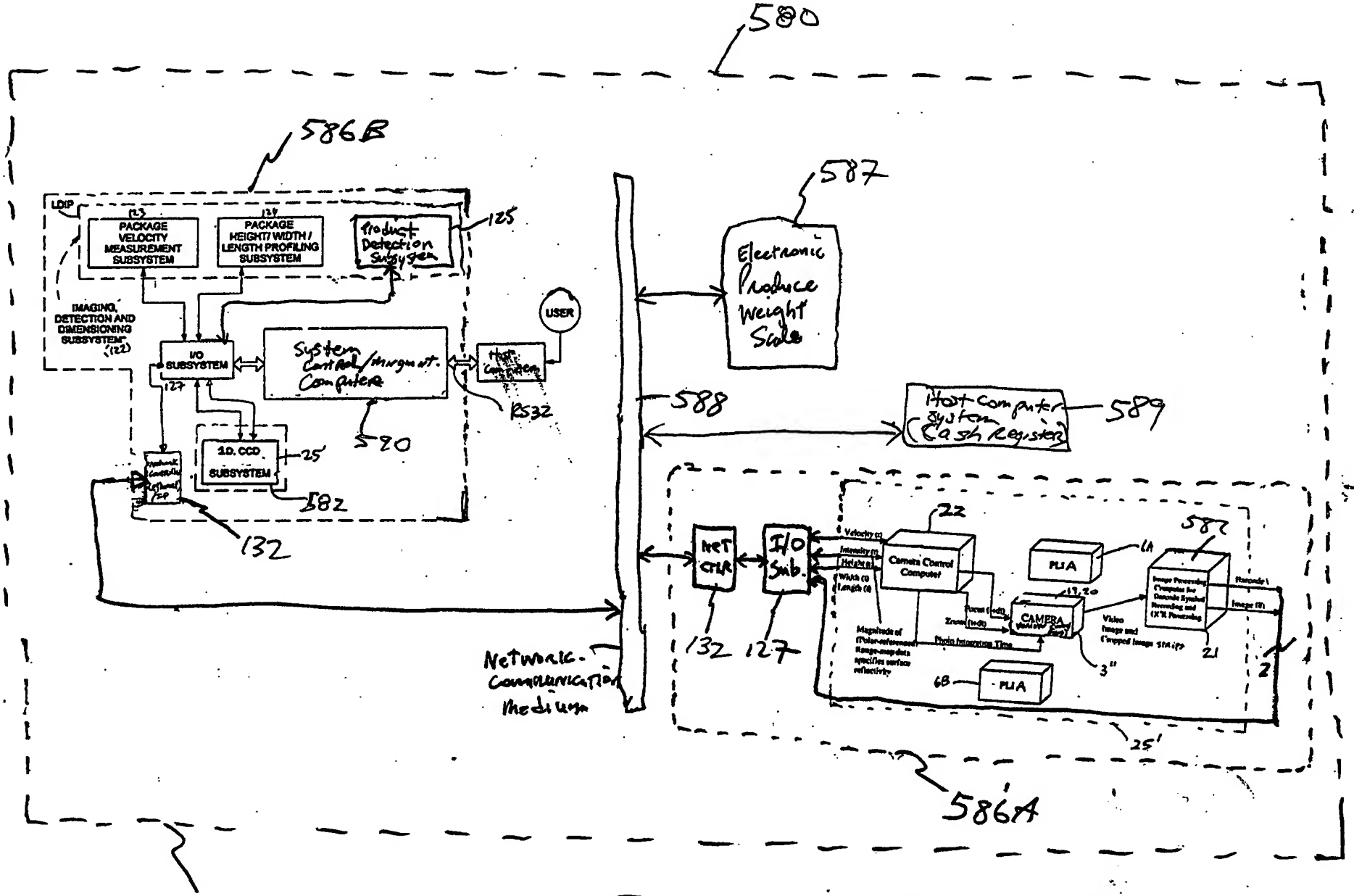


FIG. 33C FIGS. 33C1 and 33C2

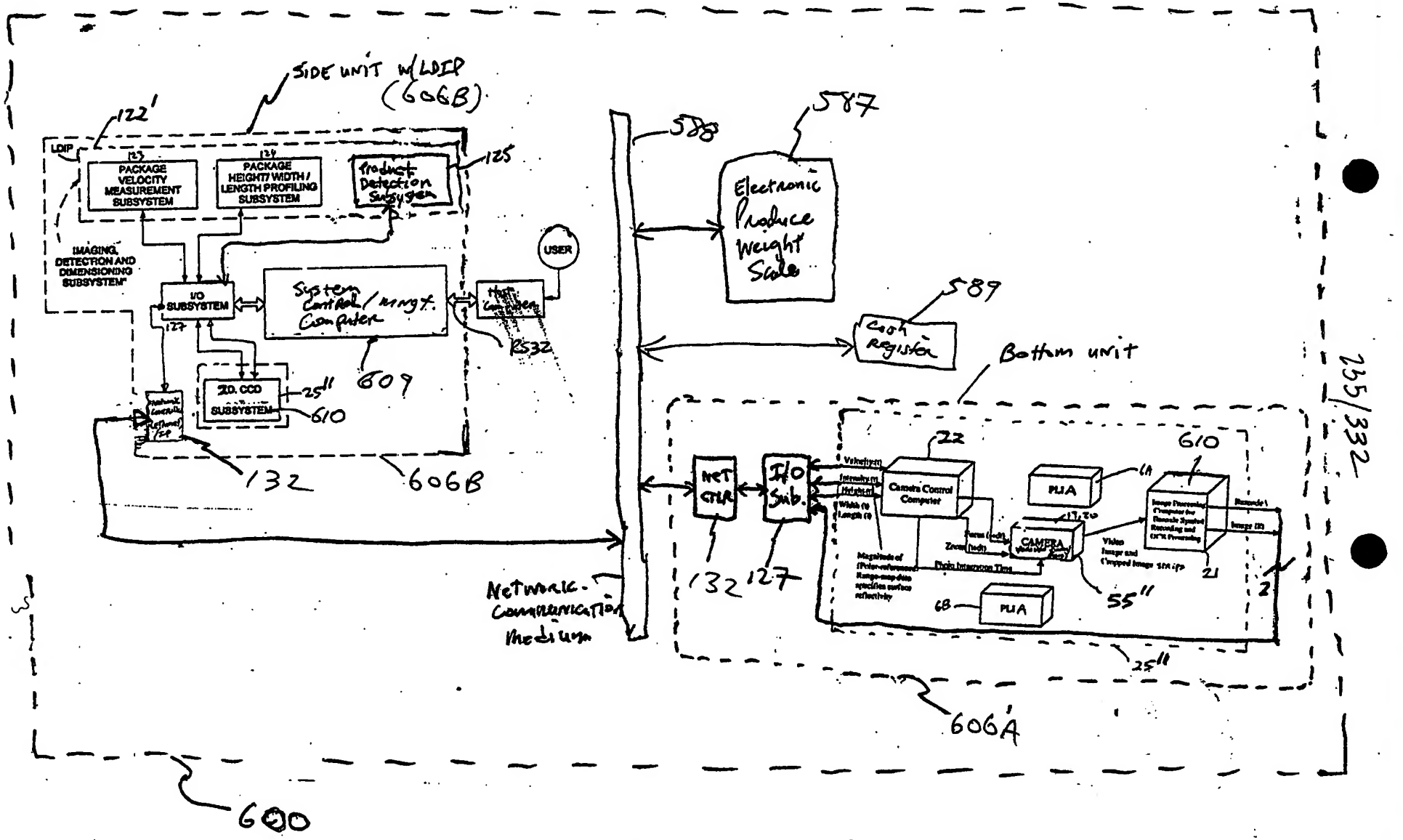


FIG 34C Figs. 34C1 and 34C2

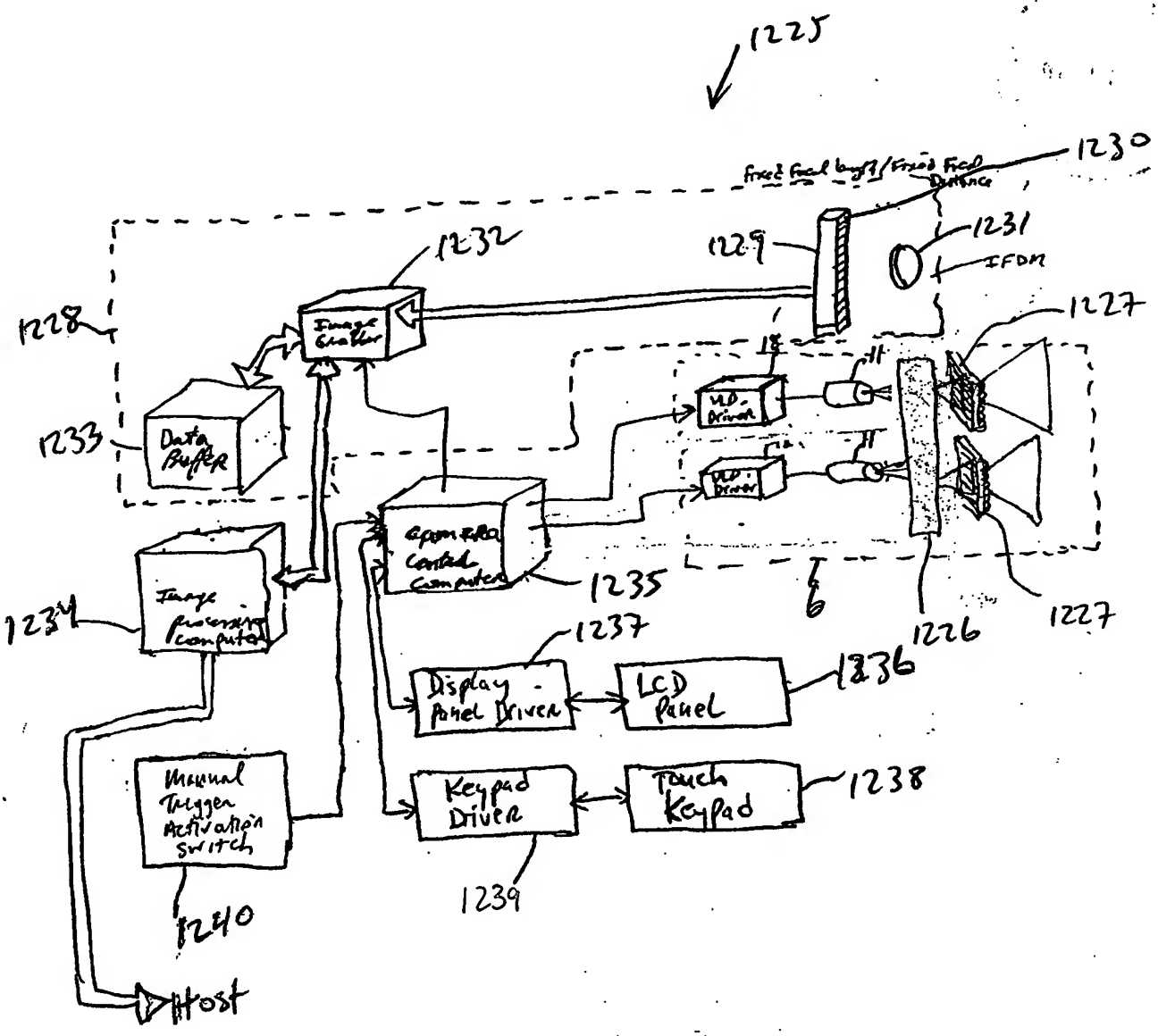

1225
1230
Fixed Focal Length/Fixed Focal Distance
1229
1231
IFOV
1232
1228
Image Grabber
1227
1233
Data Buffer
VLD Driver
VLD Driver
Camera Control Computer
1235
1234
Image Processing Computer
1226
1227
1237
Display Panel Driver
LCD Panel
1236
Manual Trigger Activation Switch
Keypad Driver
Touch Keypad
1238
1239
1240
Host

FIG. 40A1

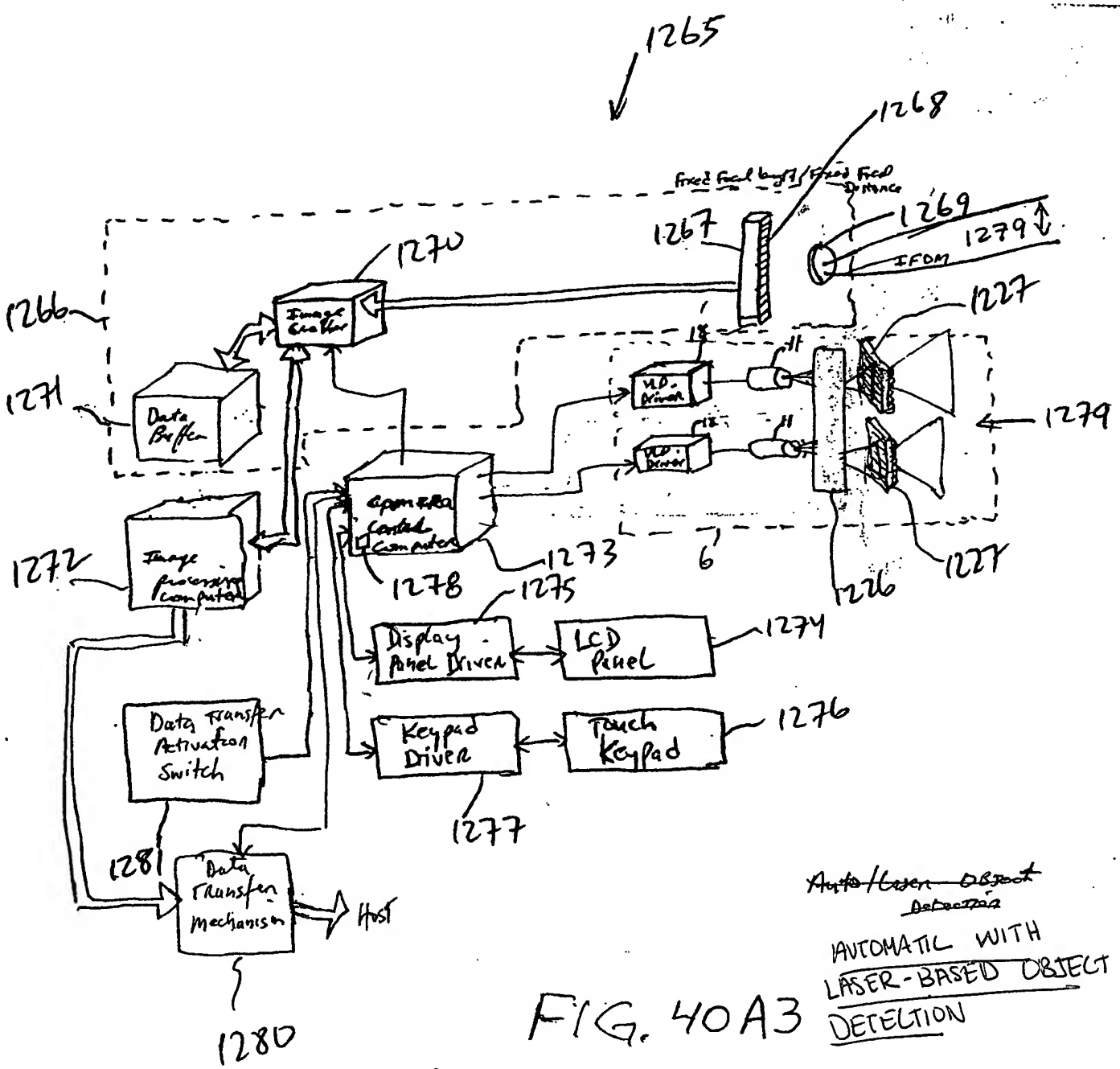


FIG. 40A3

~~Auto/Laser Object Detection~~
AUTOMATIC WITH LASER-BASED OBJECT DETECTION

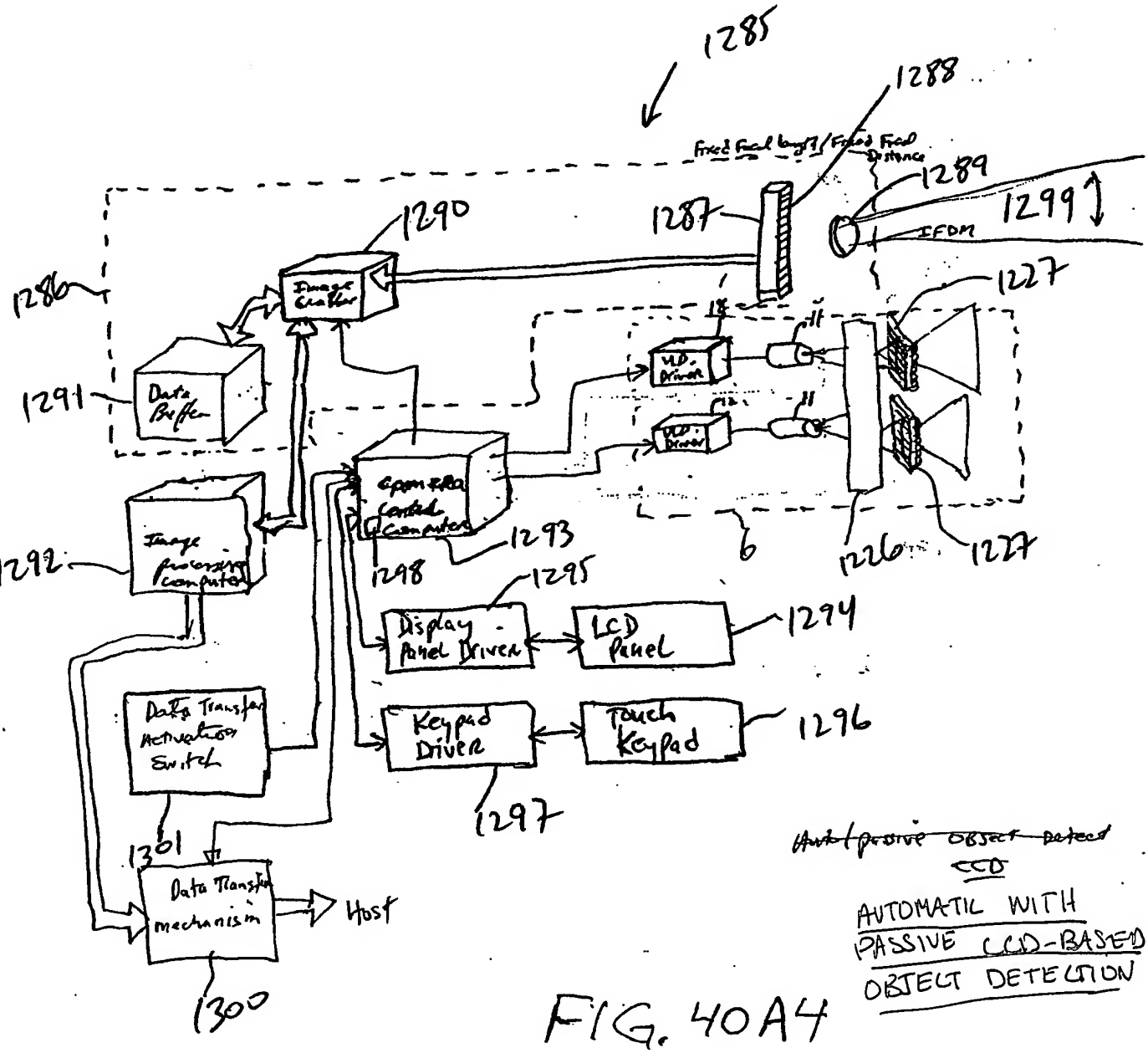
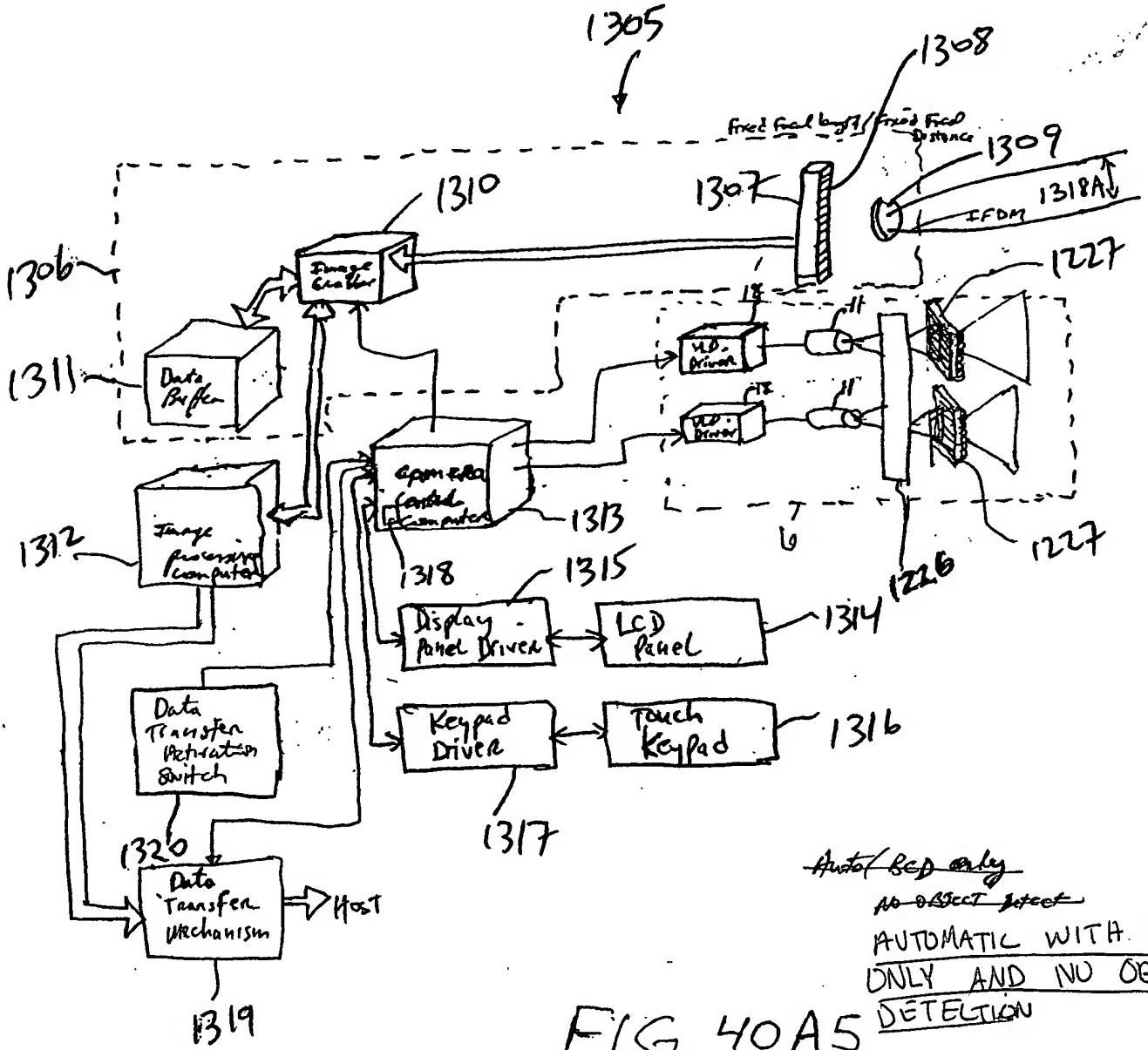


FIG. 40A4

~~Auto/passive object detect~~
CCD
AUTOMATIC WITH PASSIVE CCD-BASED OBJECT DETECTION



~~Auto/ BCD only~~
~~No object detect~~
AUTOMATIC WITH BCD ONLY AND NO OBJECT DETECTION

FIG. 40A5

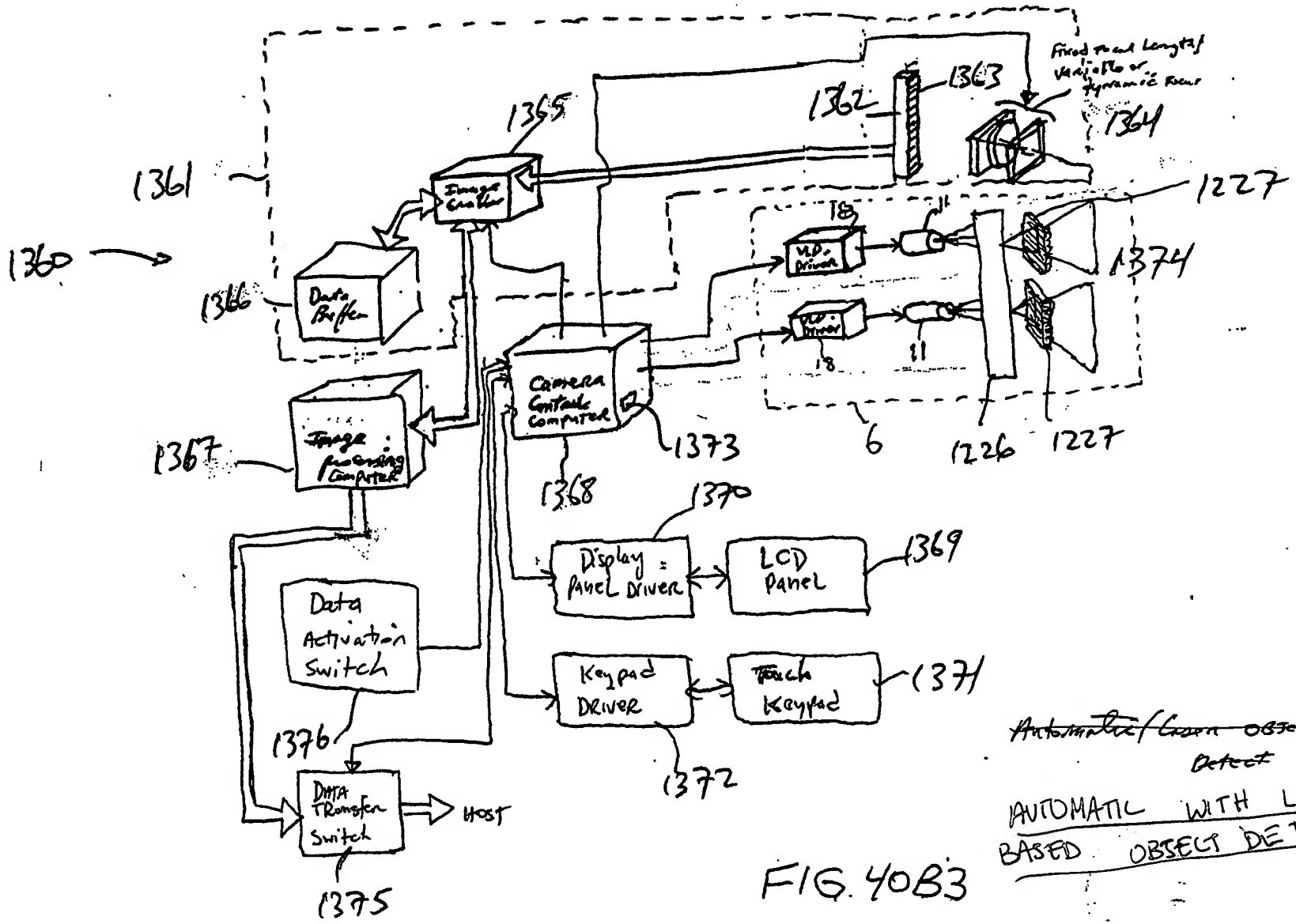


FIG. 40B3

~~Automatic/Laser Object Detect~~

AUTOMATIC WITH LASER BASED OBJECT DETECTION

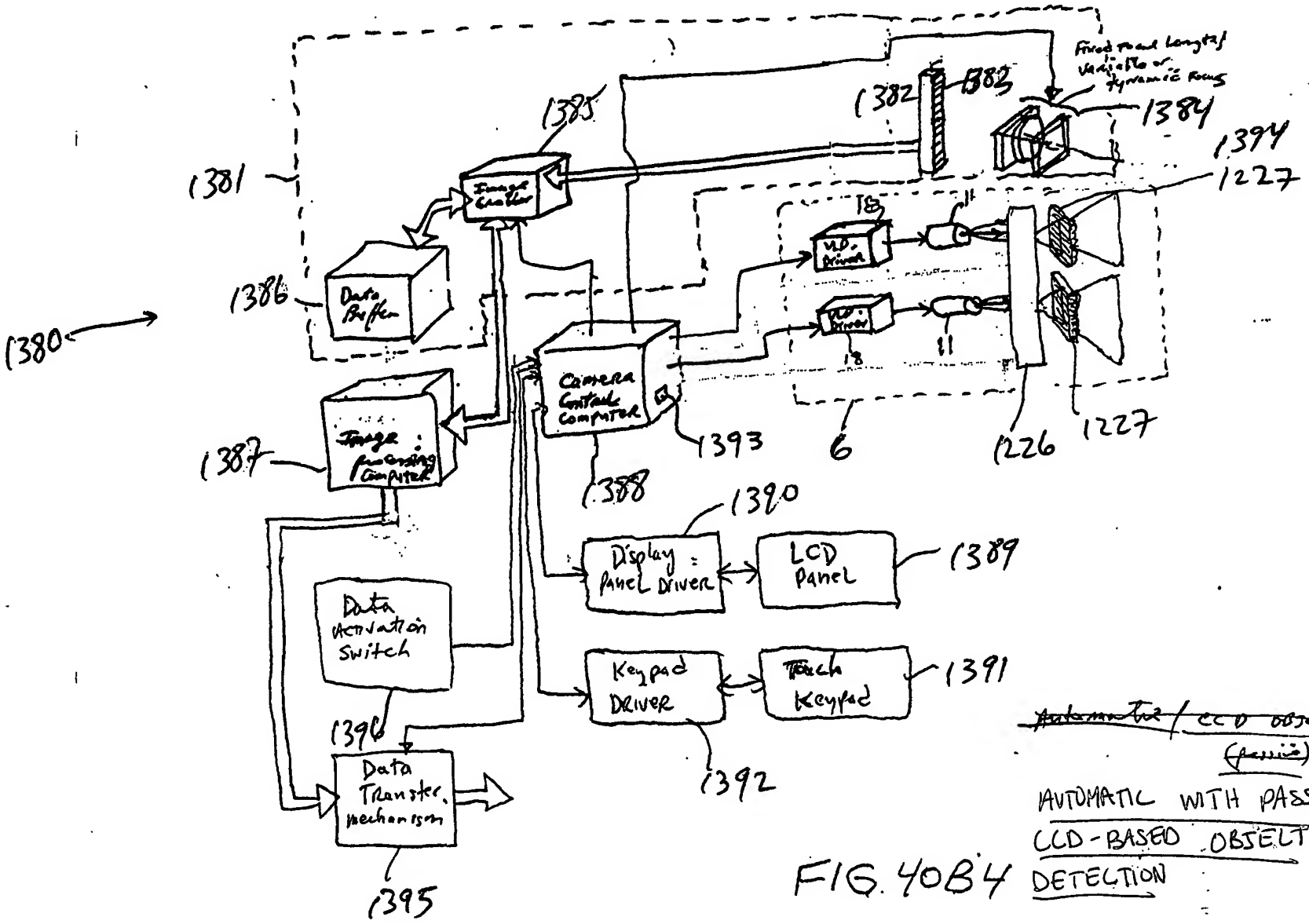


FIG. 40B4

~~Automatic / CCD Object Detect~~
(Passive)
AUTOMATIC WITH PASSIVE CCD-BASED OBJECT DETECTION

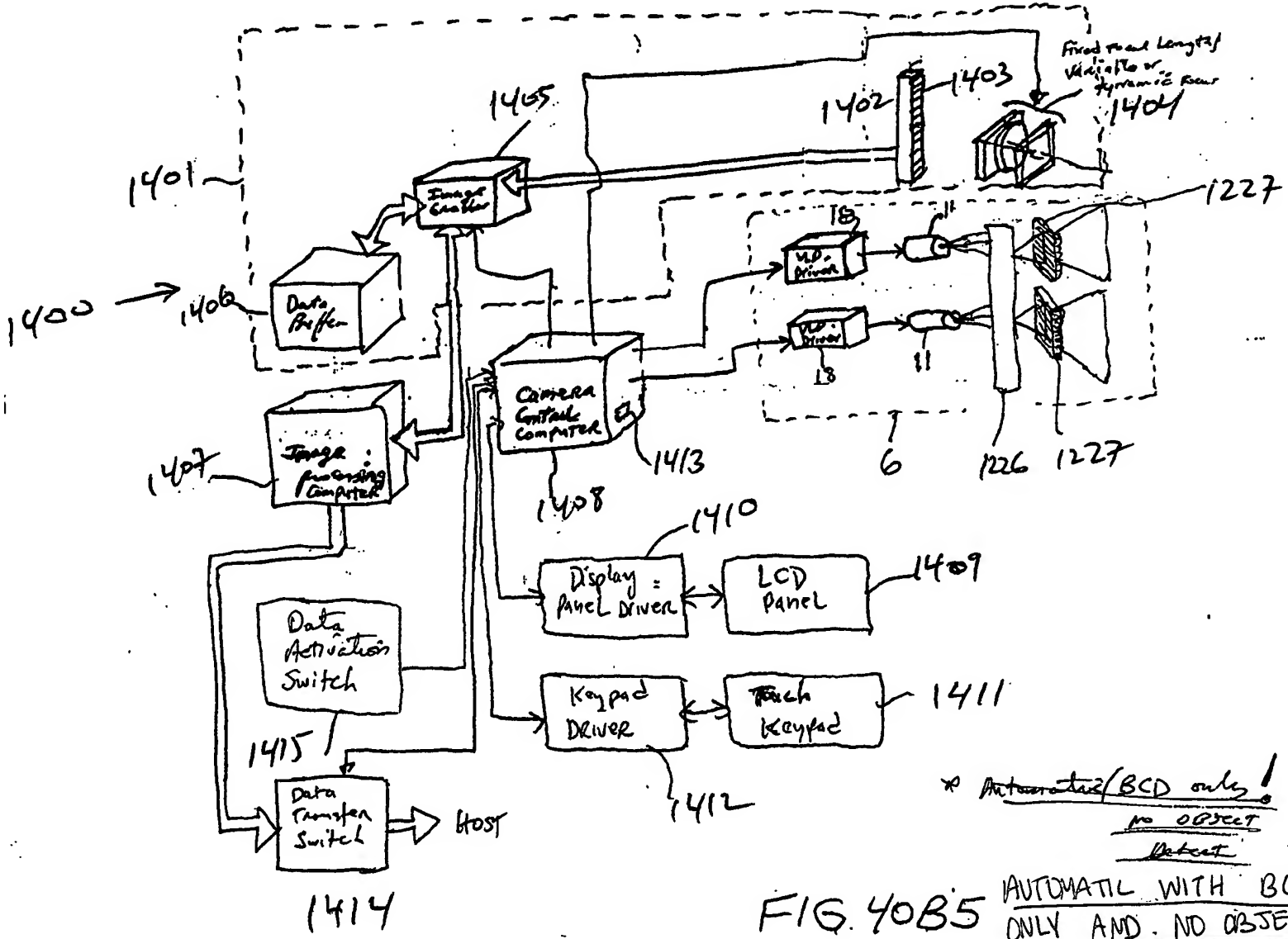


FIG. 40B5

* Automatic/BCD only! no OBJECT Detect

AUTOMATIC WITH BCD ONLY AND NO OBJECT DETECTION

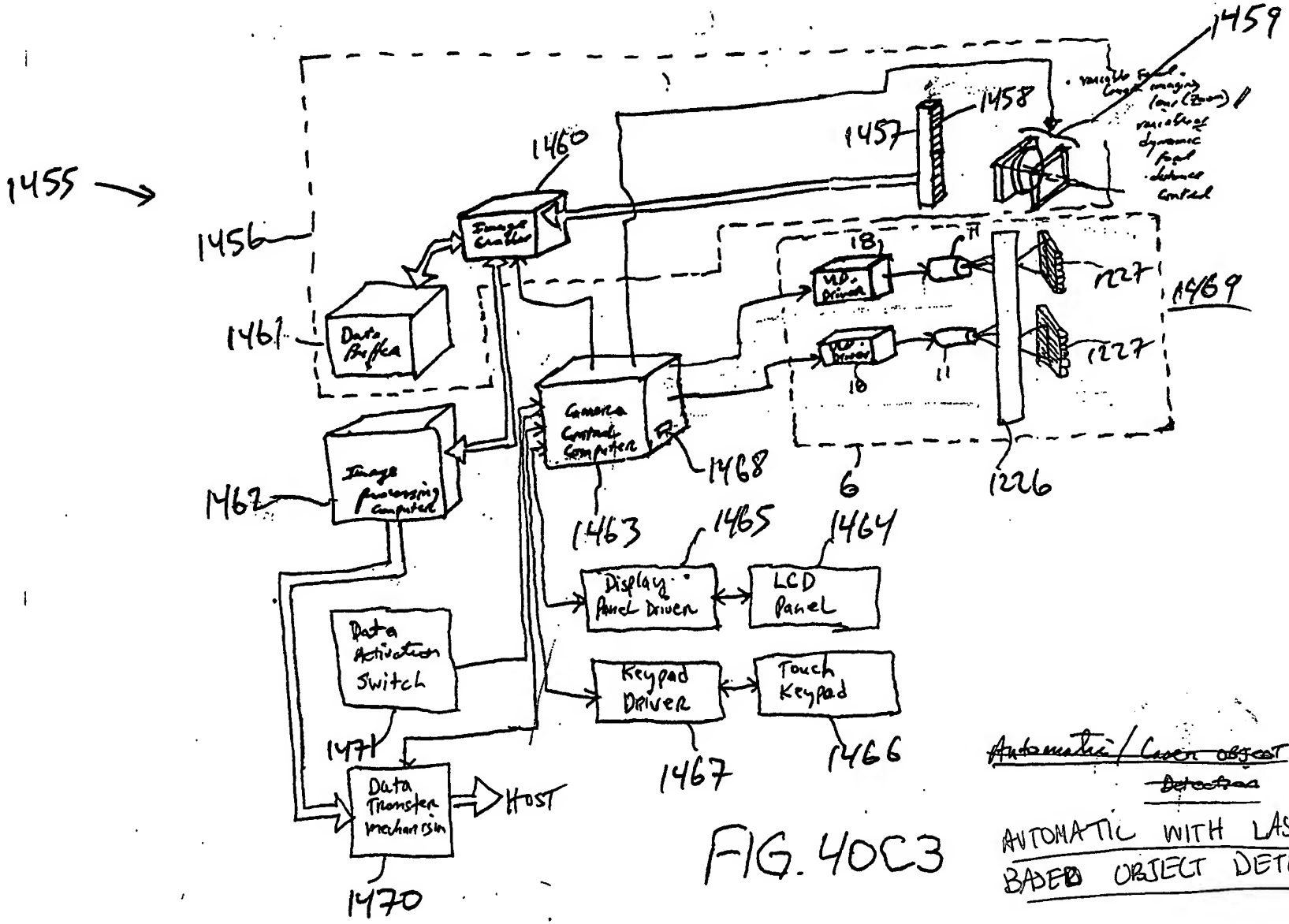


FIG. 40C3

~~Automatic / Laser object detection~~

AUTOMATIC WITH LASER BASED OBJECT DETECTION

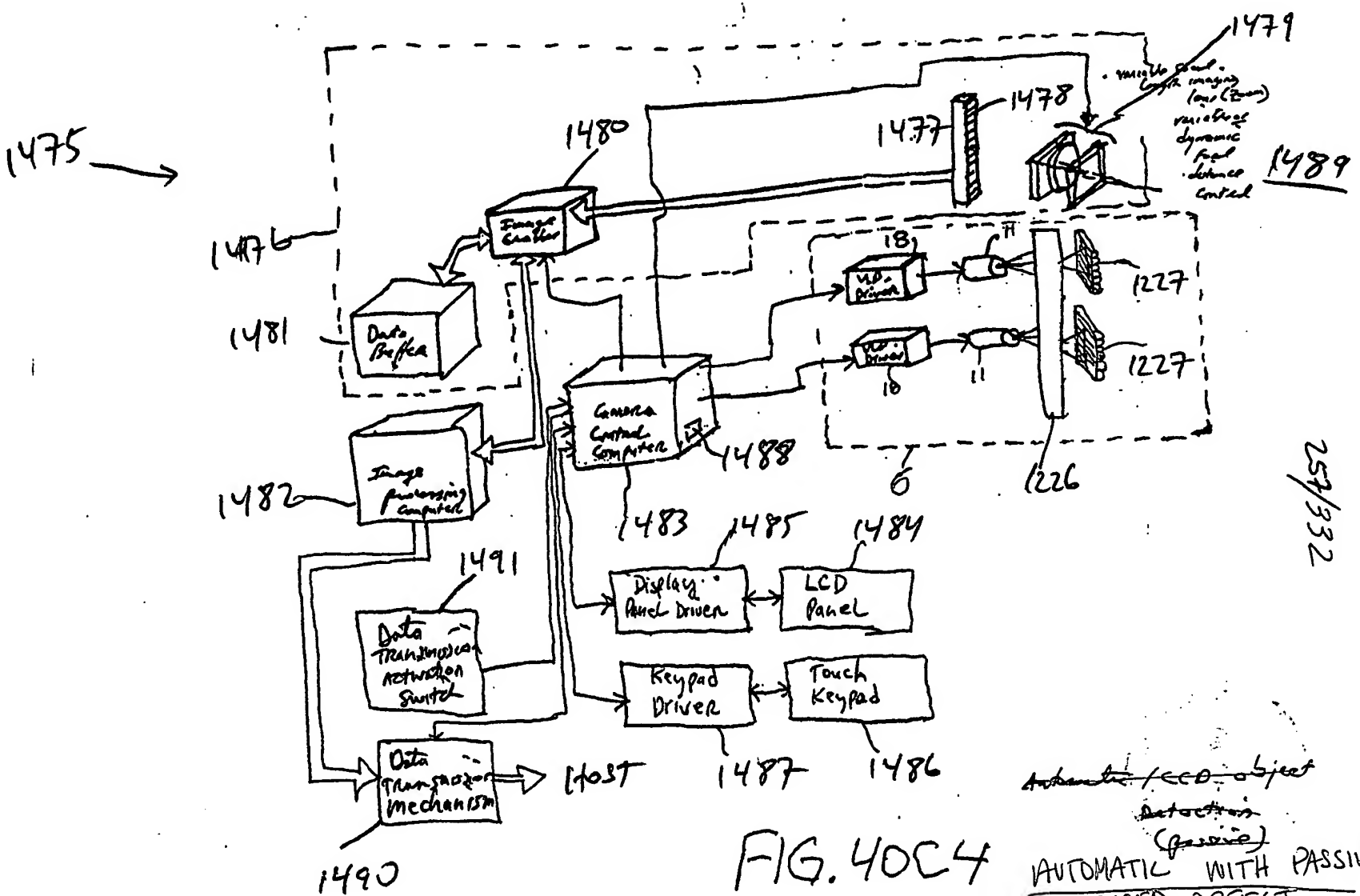


FIG. 40C4

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~~Automatic/ECO object detection (passive)~~

AUTOMATIC WITH PASSIVE CCD-BASED OBJECT DETECTION

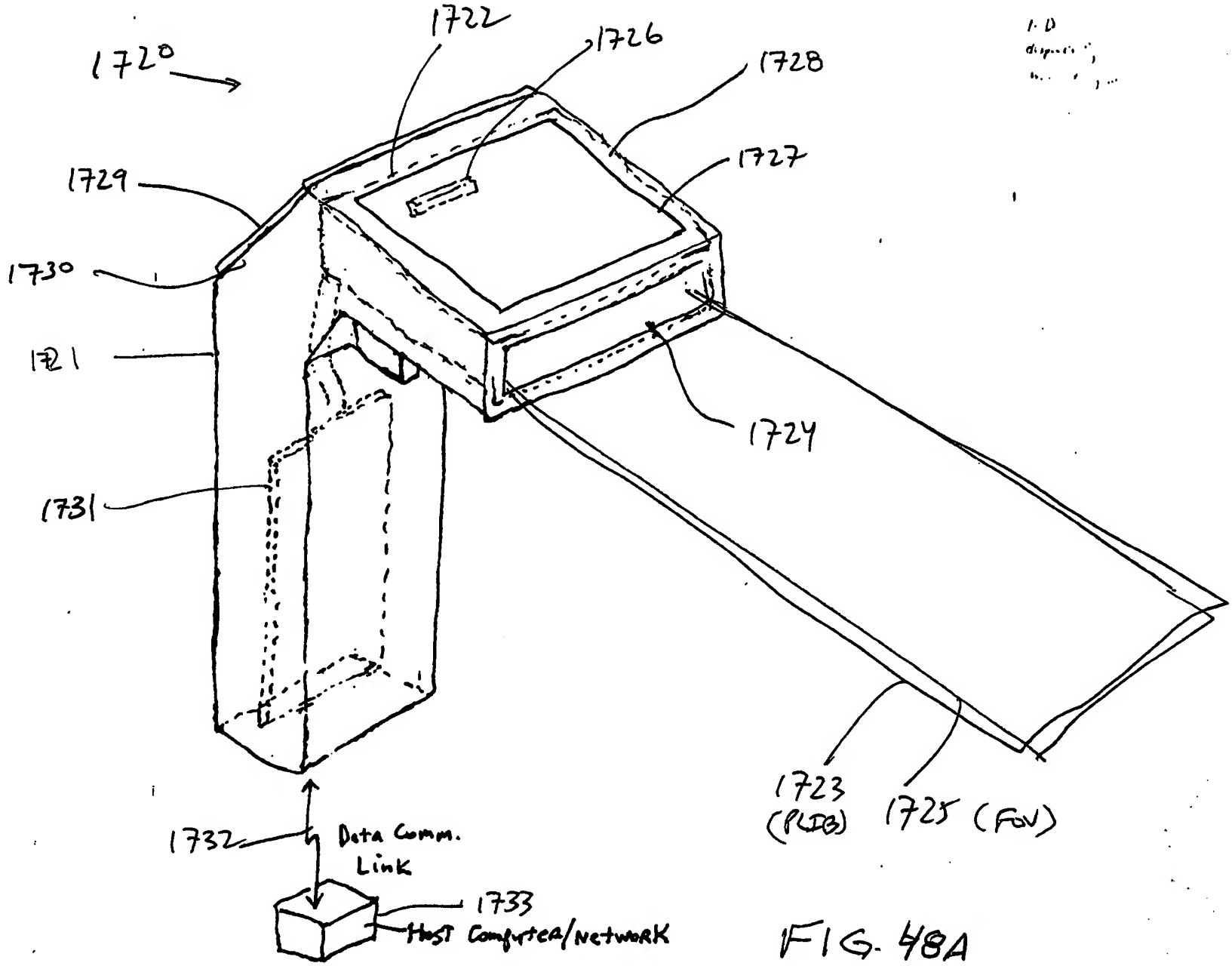
1720
1722
1726
1728
1727
1729
1730
1721
1724
1731
1723
(PLIB)
1725 (FOV)
1732
Data Comm.
Link
1733
Host Computer/Network

FIG. 48A

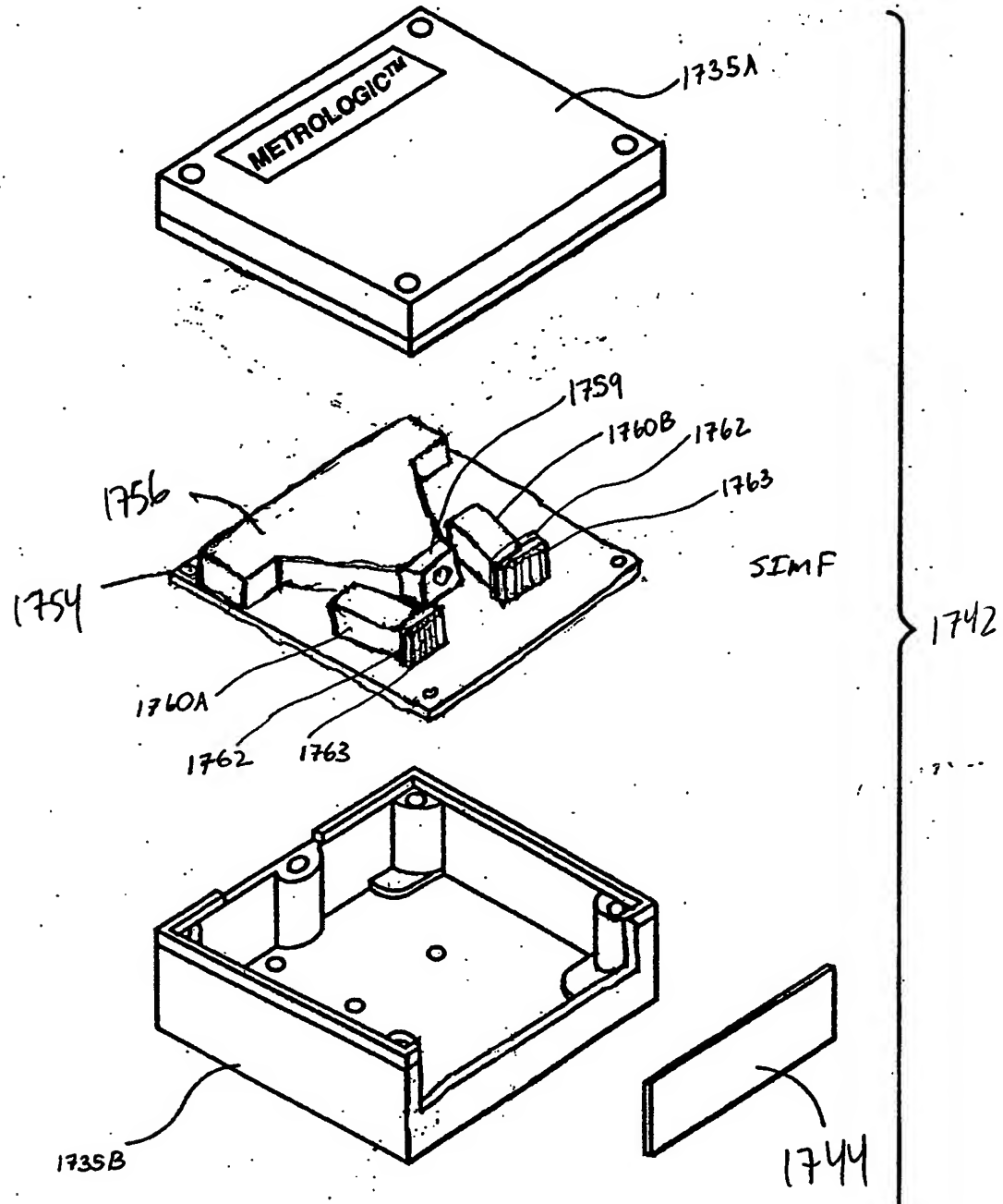
METROLOGIC™
1735A
1759
1760B
1762
1763
1756
1754
SIMF
1760A
1762
1763
1742
1735B
1744

FIG. 49B

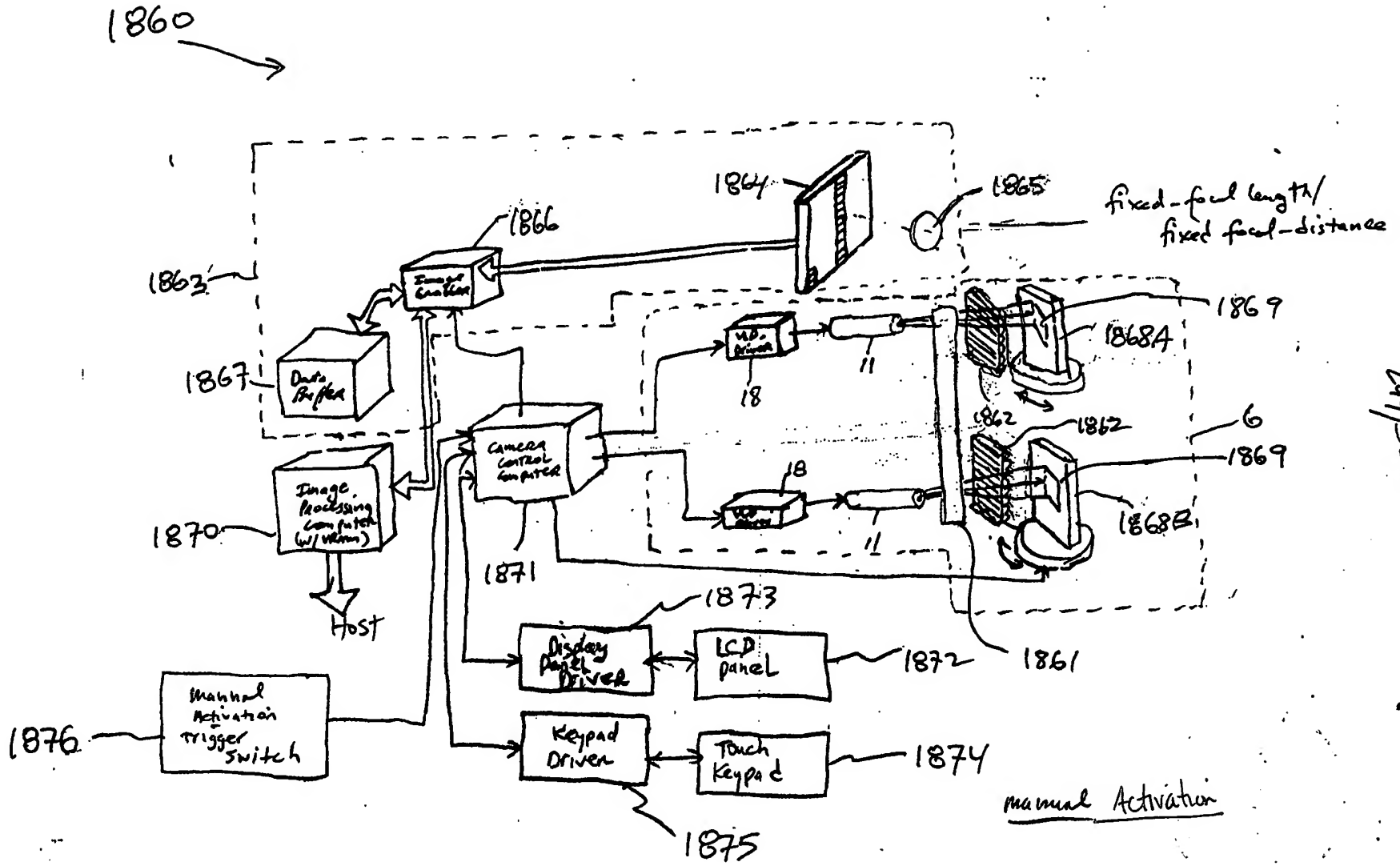
1860
1864
1865
fixed-focal length/
fixed focal-distance
1866
1863
1869
1868A
1867
Data Buffer
18
11
1862
6
Camera Control Computer
1868B
1870
Image Processing Computer (w/ Memory)
1871
Host
1873
Display Panel Driver
LCD panel
1872
1861
Manual Activation trigger switch
1876
Keypad Driver
Touch Keypad
1874
1875
manual Activation

FIG. 53A1

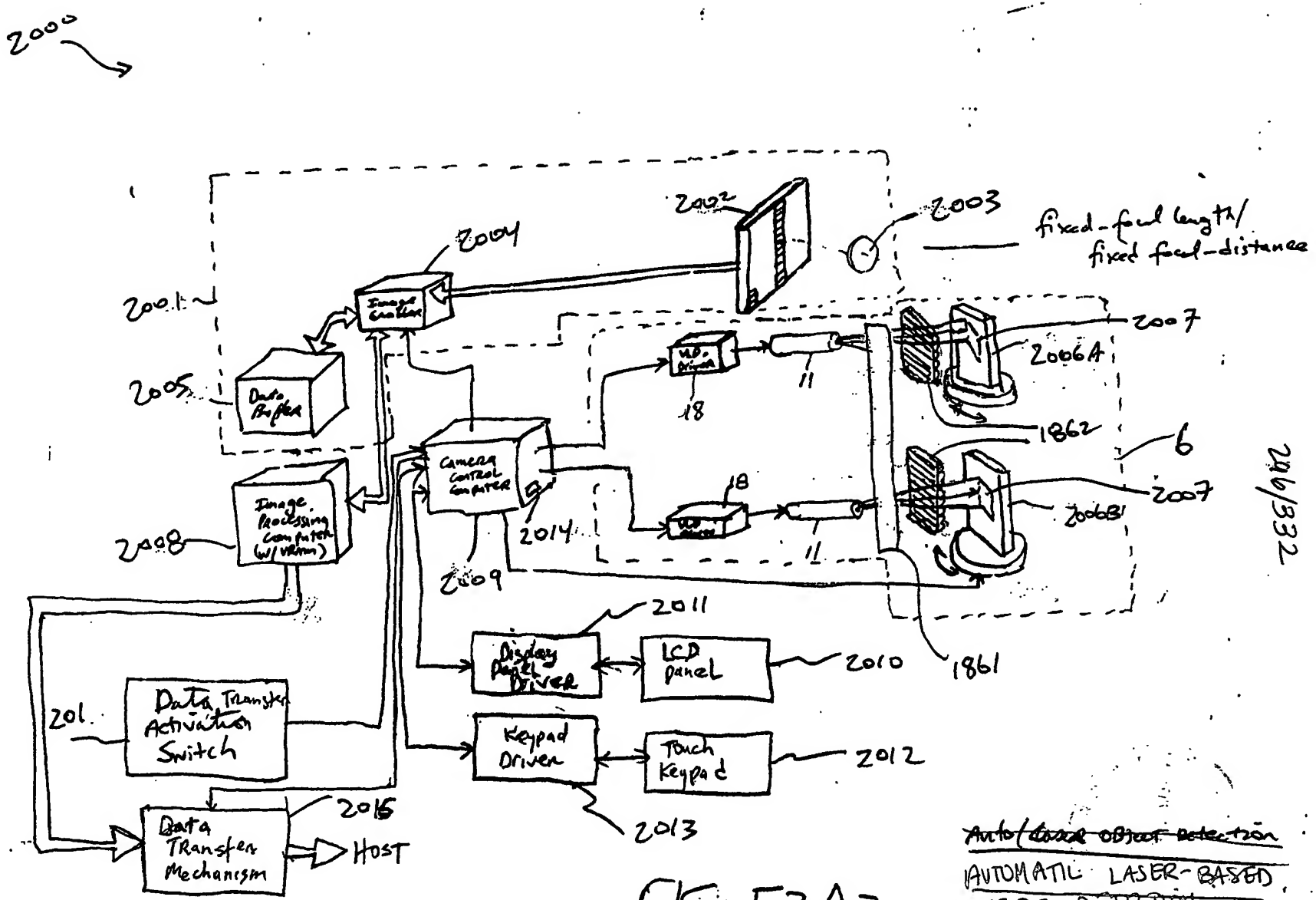

FIG. 53A3

~~Auto/laser object detection~~

AUTOMATIC LASER-BASED OBJECT DETECTION

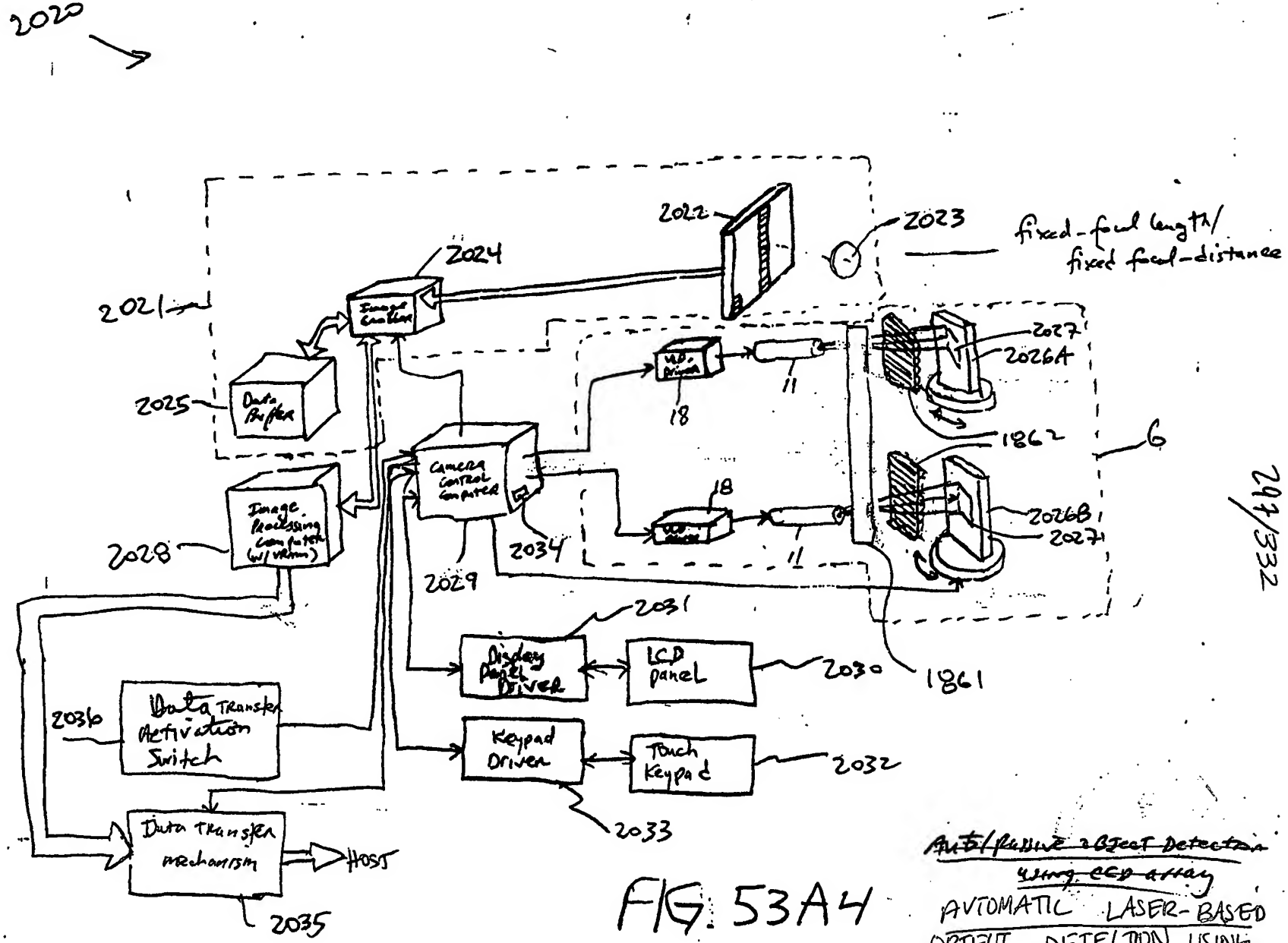

FIG. 53A4

~~Auto/Passive Object Detection using CCD array~~

AUTOMATIC LASER-BASED OBJECT DETECTION USING CCD ARRAY

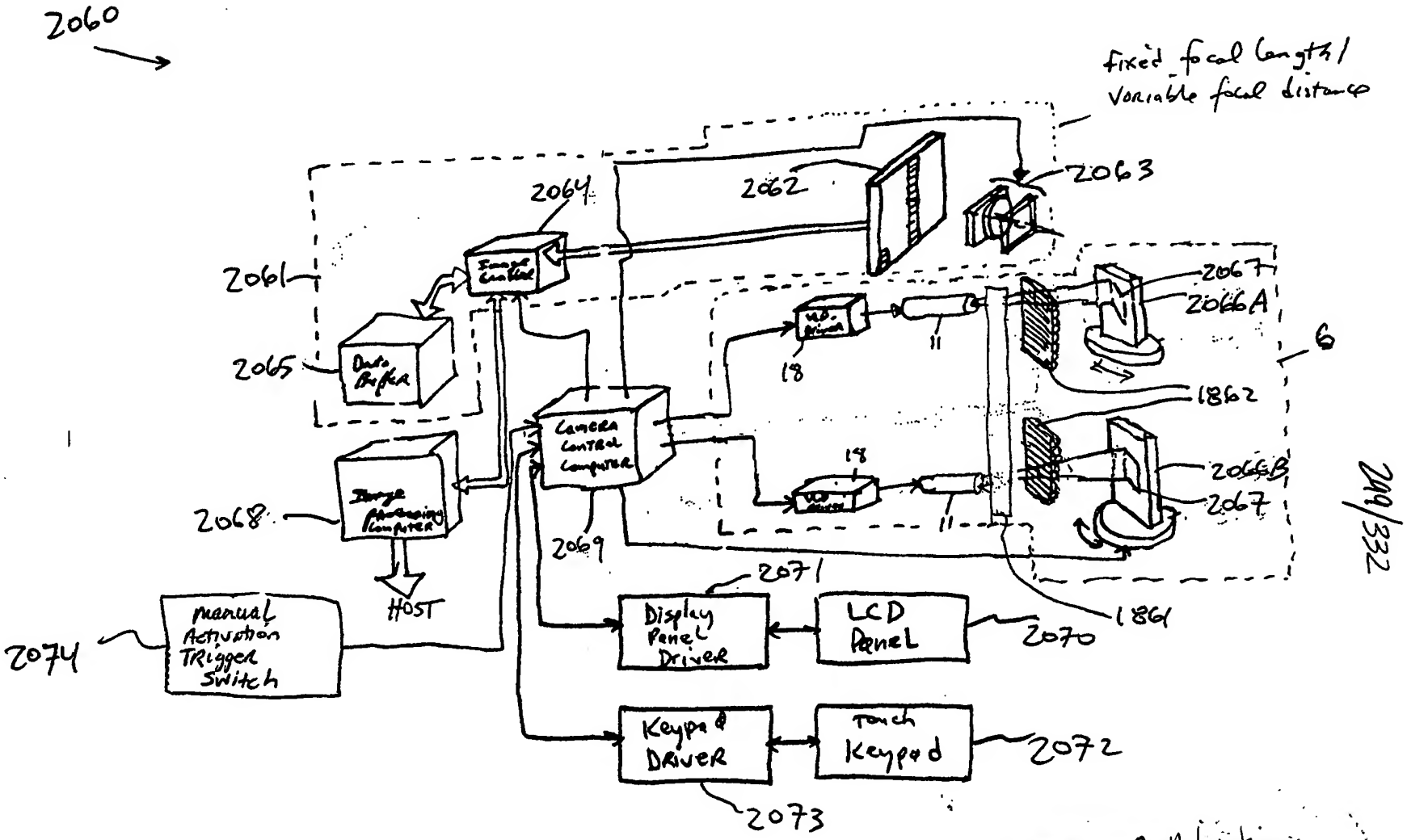
2060
fixed focal length/
variable focal distance
2063
2062
2064
2061
2067
2066A
2065
6
18
11
1862
Camera Control Computer
2066B
2067
2068
2069
HOST
2071
manual Activation Trigger Switch
Display Panel Driver
LCD Panel
2070
1861
2074
Keypad DRIVER
Touch Keypad
2072
2073
manual Activation

FIG. 53B1

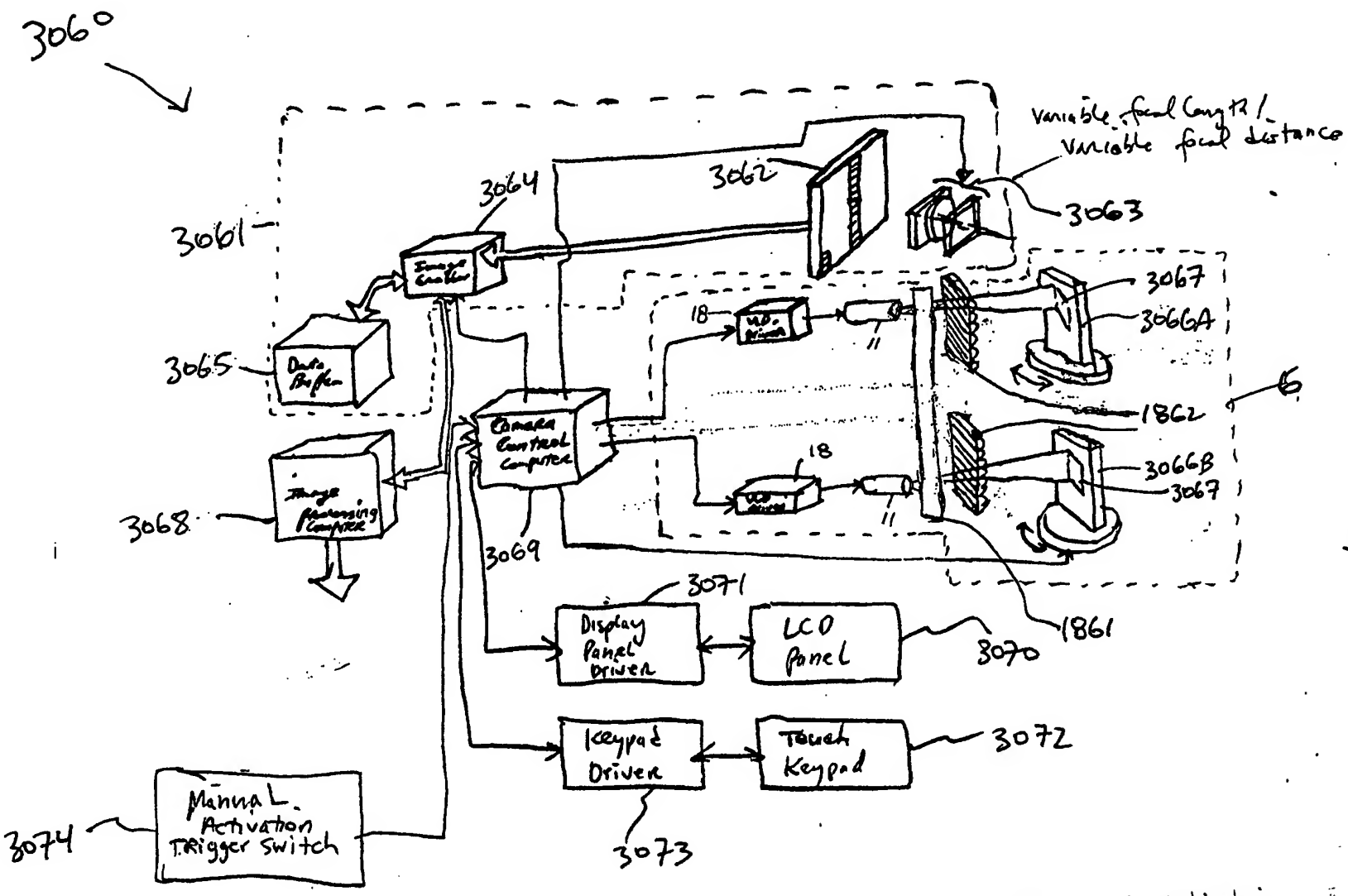
3060
Variable focal length / Variable focal distance
3062
3063
3064
3061
3067
3066A
18
3065
Data Buffer
1862
6
Camera Control Computer
18
3066B
3067
Image Processing Computer
3068
3069
3071
Display Panel Driver
LCD Panel
1861
3070
Keypad Driver
Touch Keypad
3072
Manual Activation Trigger Switch
3074
3073
Manual Activation

FIG. 53C1

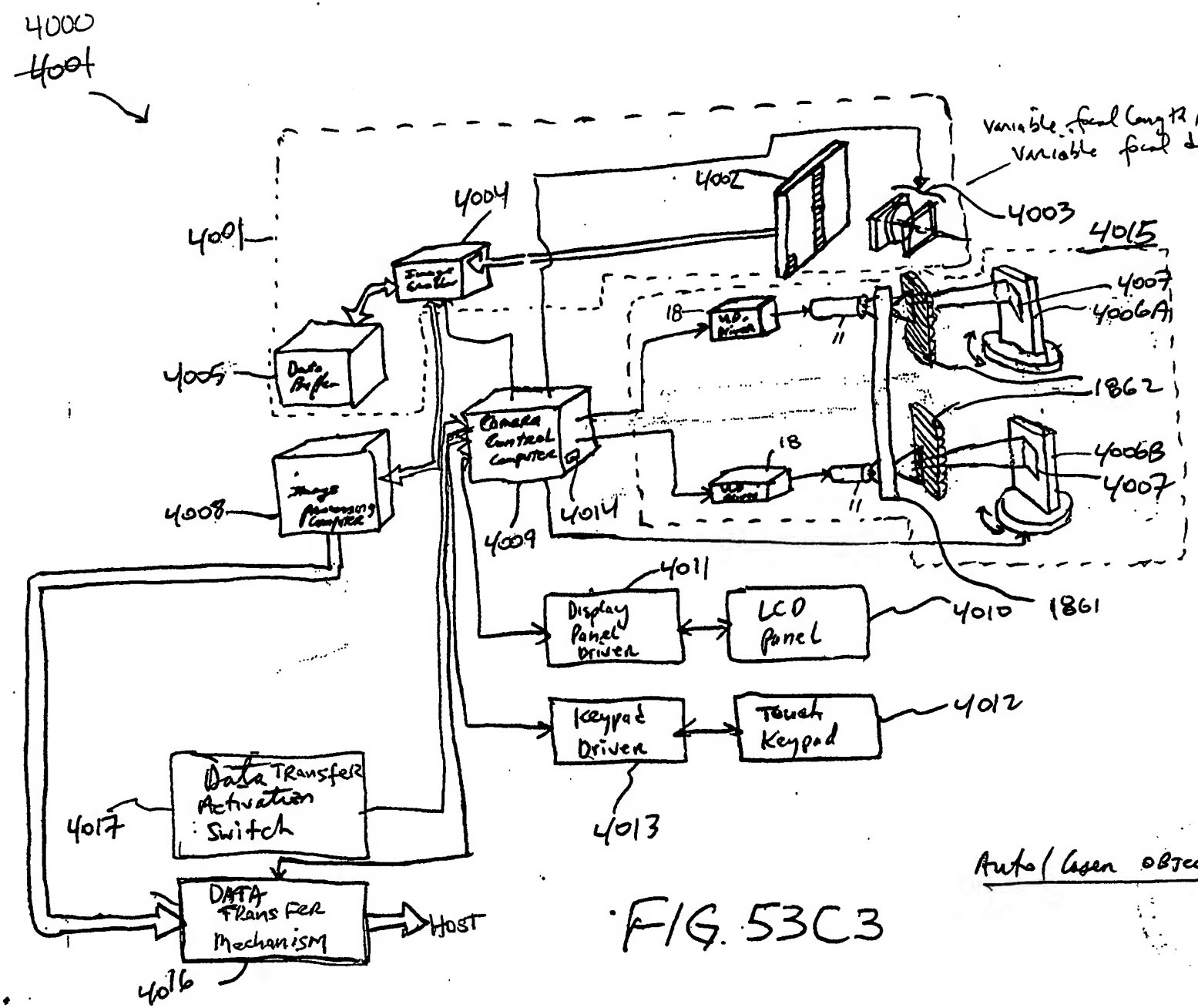

FIG. 53C3

Auto/Laser Object Detection

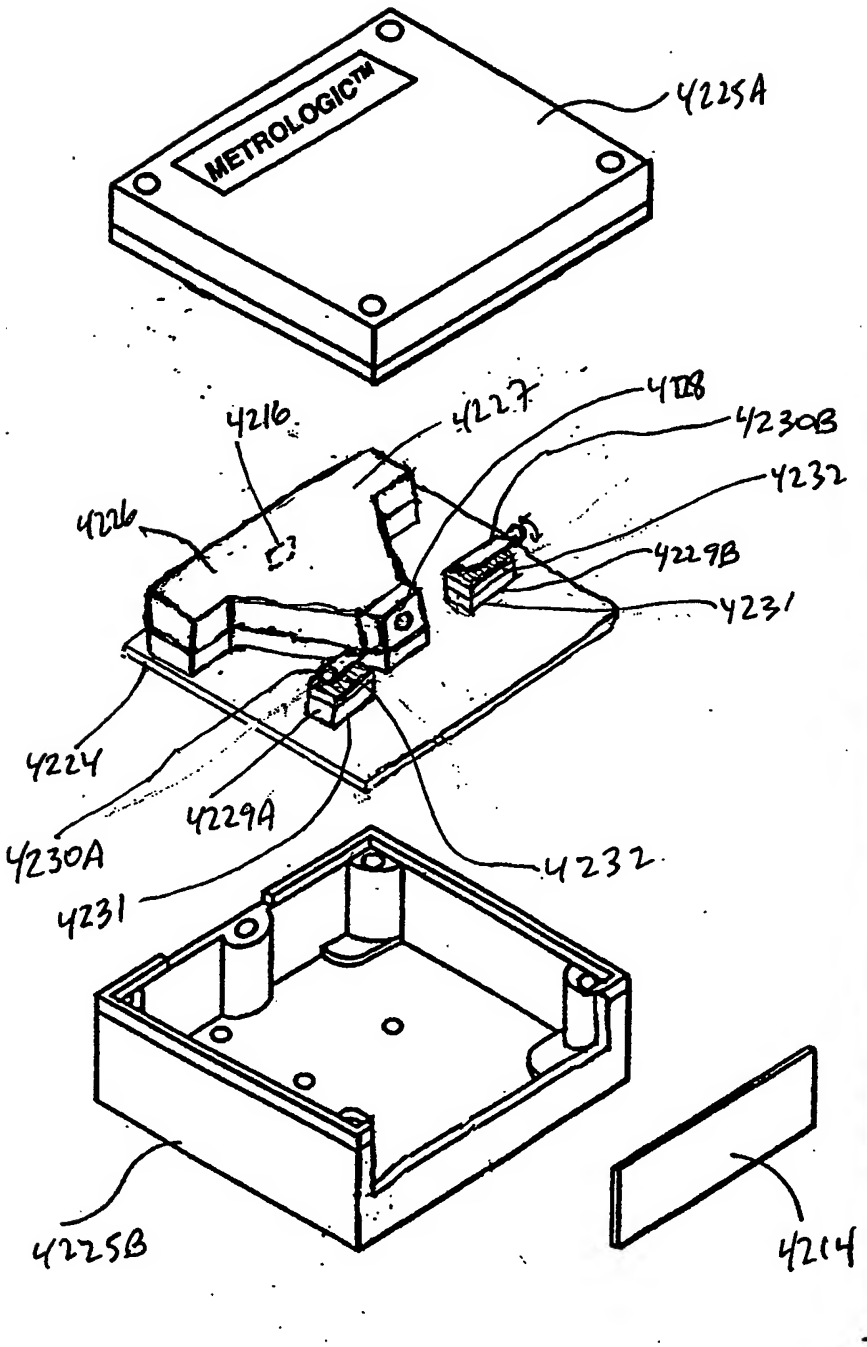

FIG. 59B

MCLD
Fig. II 15A-15B

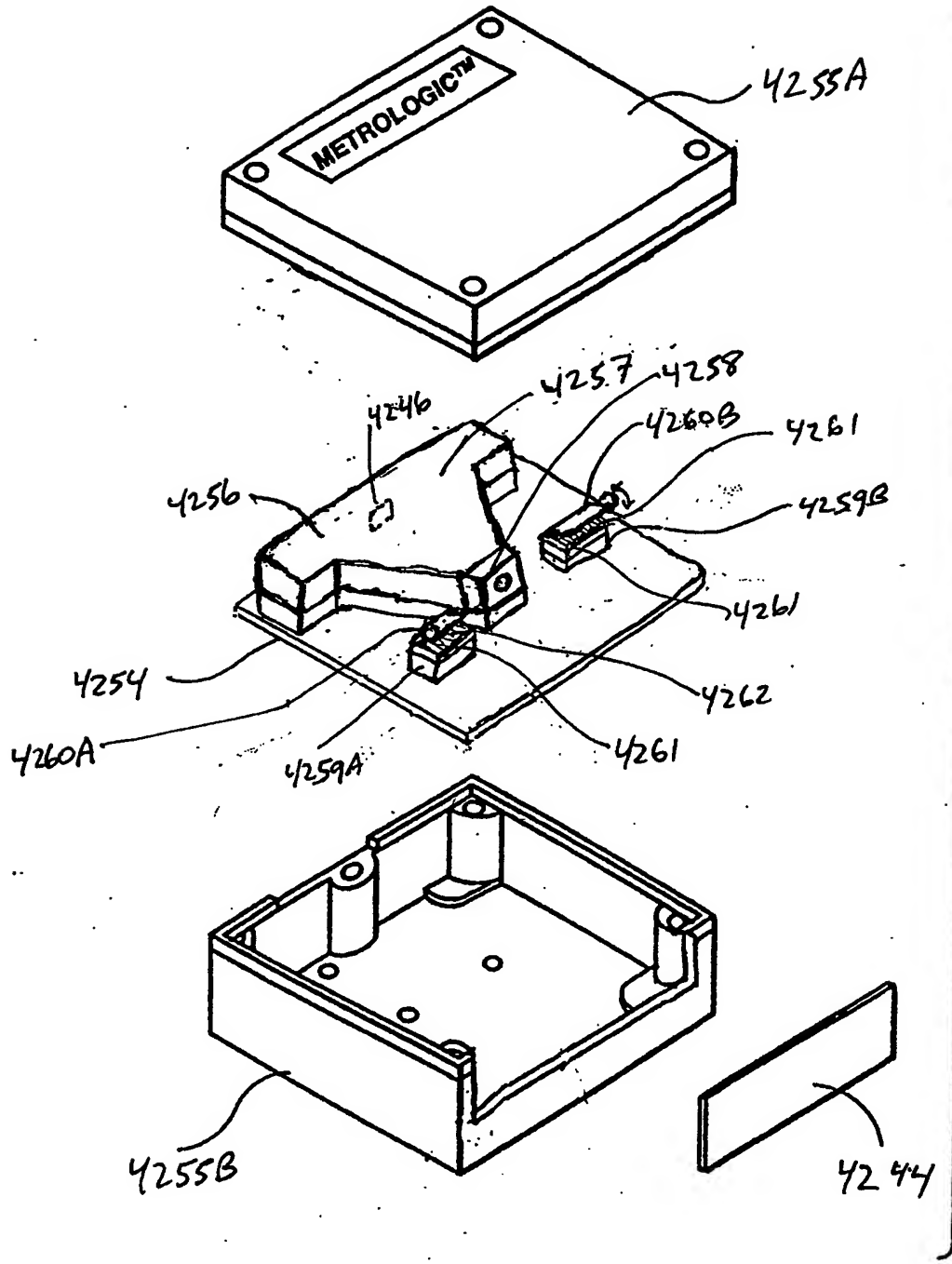

FIG. 60B

Etalon (Temp. phase mod.)
~~Bfmabaa~~
Fig. 117A-17B

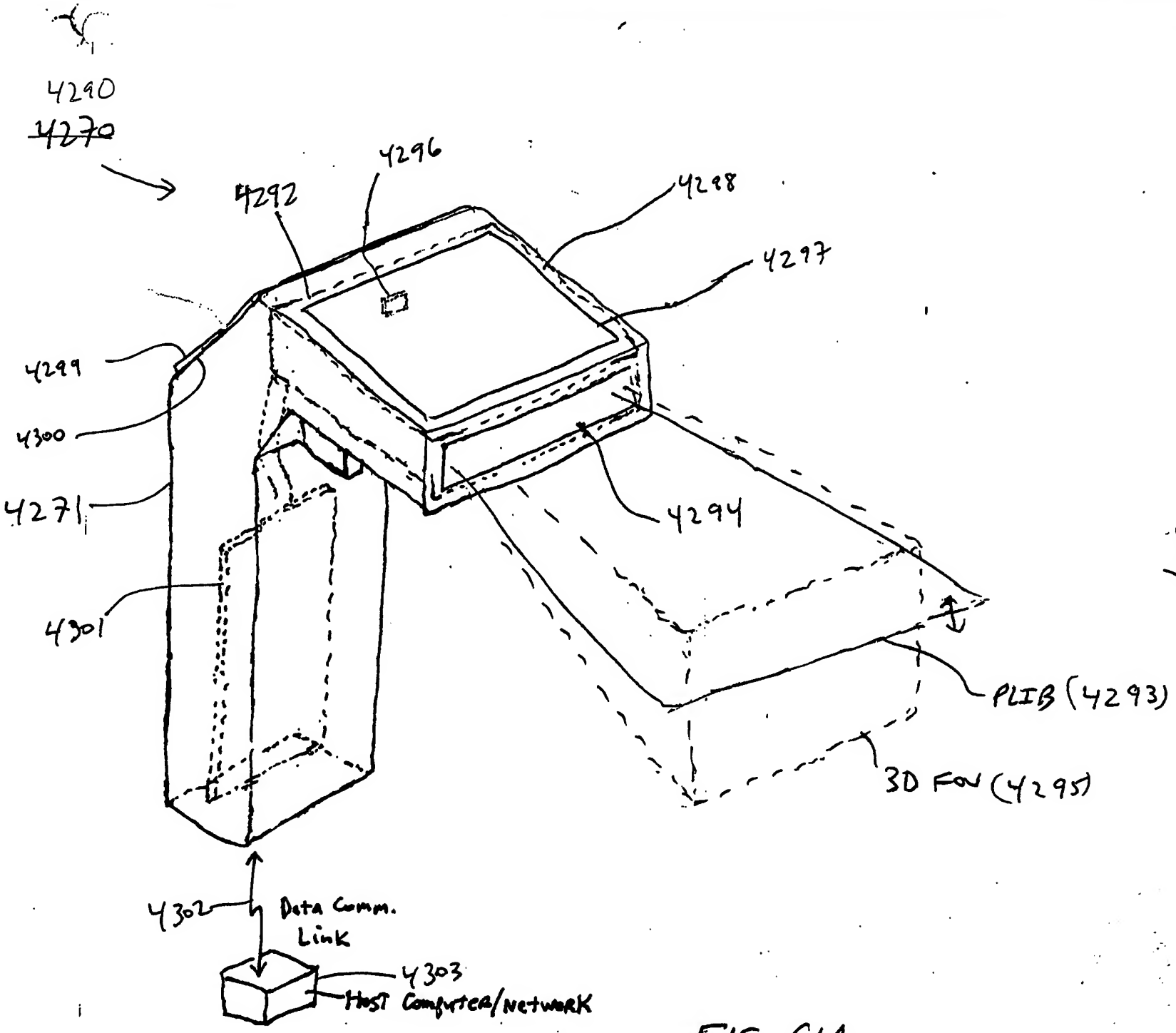

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FIG. 61A

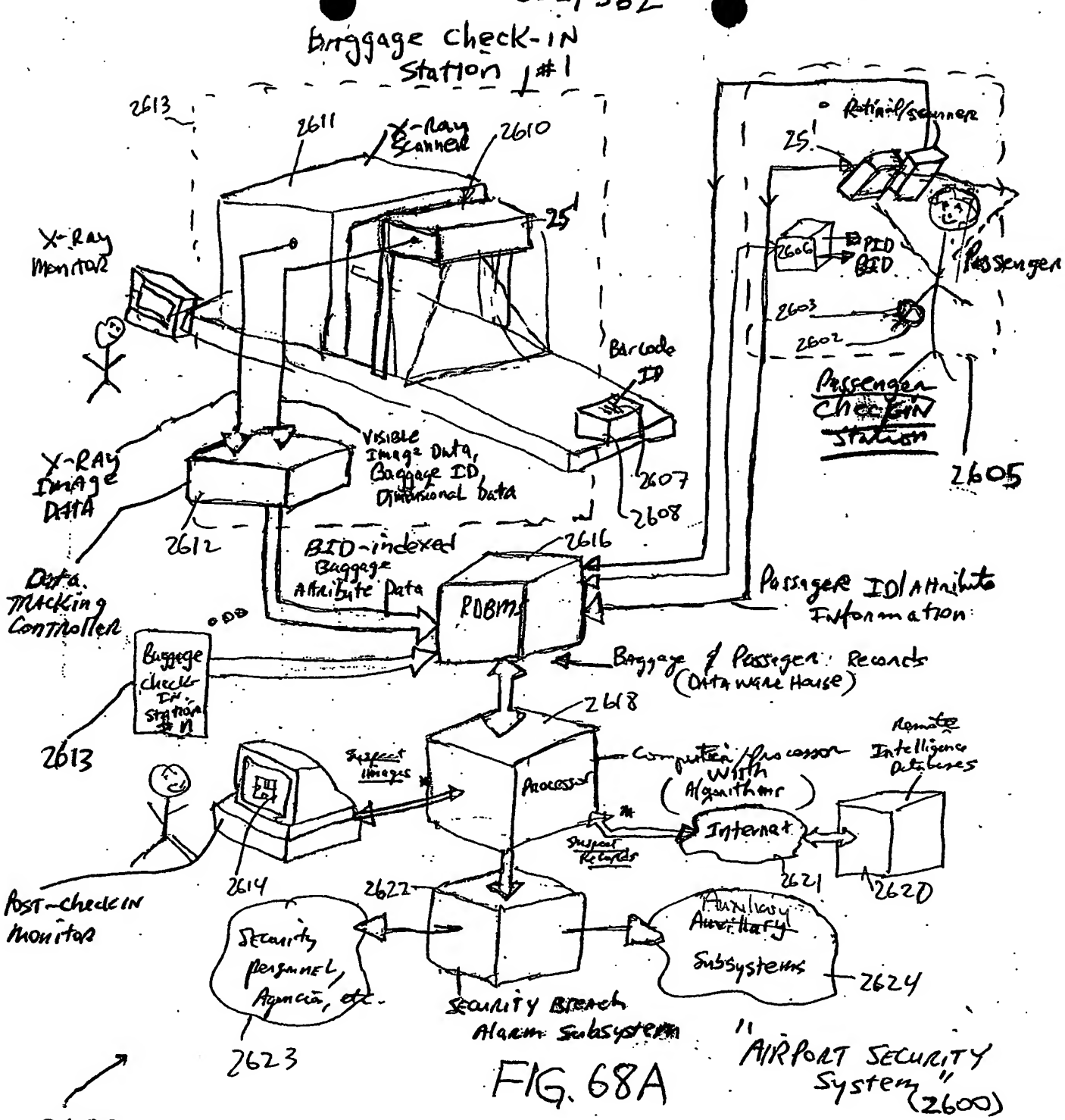

FIG. 68A

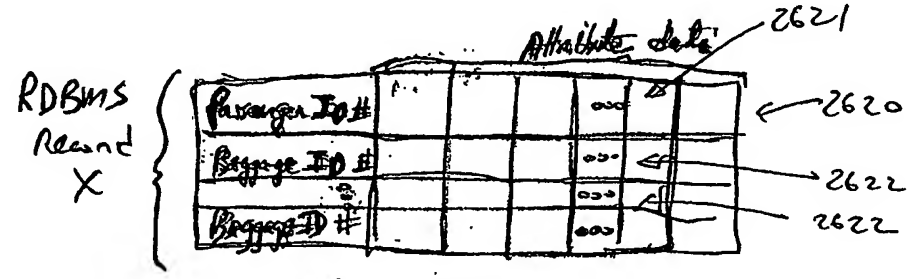

FIG. 68B